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ABSTRACT

Instructional Television Fixed Service (ITFS) is comprised of 31 television channels in the 2500-2690 MHz frequency range reserved by the Federal Communication Commission (FCC) for use by educational institutions and organizations. This study delineates the history of instructional television with special reference to ITFS and provides a consideration of the relationships among various alternate methods of television distribution. Conclusions regarding the state of the art of ITFS are based on the author's survey of the present ITFS licensees and applicants, interviews with persons involved in various aspects of ITFS utilization, and personal visits to individual ITFS systems. Survey results are geographically depicted to indicate comparisons among systems in terms of size, staff, equipment, budget, and utilization. The study provides statistical profiles of the 65 ITFS systems on the air in April 1970 and a directory of persons responsible for individual systems. Appendixes include tables of frequency assignments, information on private users of the ITFS band, and FCC application procedures. The author concludes that the problems of ITFS stem more from the administrative and educational structure than from any deficiency in the bases engineering capabilities of ITFS. A series of suggestions to remedy these problems is listed. (Author/JY)

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THE CATHOLIC UNIVERSITY OF AMERICA

INSTRUCTIONAL TELEVISION FIXED SERVICE: ASSESSMENT OF THE TECHNICAL AND EDUCATIONAL STATE OF THE ART

A DISSERTATION

Submitted to the Faculty of the
School of Education
Of The Catholic University of America
In Partial Fulfillment of the Requirements
For the Degree
Doctor of Philosophy

By

Francis Richard Birmingham, Jr.

Washington, D.C.
1970

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The major credit for this study must ben given to the individuals directly involved with and interested in the development of ITFS systems who have generously given of their time and information in order to provide documentation for the present study. The cooperation shown by these educators is evident in the extensive and candid personal interviews which form a major portion of this documentation.

This spirit was reflected on a much broader scale by the care with which directors of ITFS systems and their representatives completed the survey questionnaire -- a wearisome and thankless task at best. This evident cooperation is indicative of a commitment on the part of these individuals to education, to instructional television and to the development of ITFS.

An expression of appreciation is due also to the director of this dissertation, Doctor Frederick Breitenfeld, Jr., Executive Director of the Maryland Center for Public Broadcasting, who has given of his limited time and his extensive knowledge in defining the parameters, focus and implementation of this dissertation. Sister Mary Sarah Fasen-

myer and Doctor Gabriel Ofiesh, readers of the dissertation, have also provided both sound advice and valid recommendations for change which have greatly strengthened this final product.

A special acknowledgement is also extended to the several staff members of the Federal Communications Commission who have spent many hours confirming the accuracy of these statistics, clarifying specific questions and generally supporting the progress of this study.

PREFACE

Instructional Television Fixed Service (ITFS) refers to a group of 31 television channels in the 2500-2690 MHz range that have been reserved for instructional use by the Federal Communications Commission (FCC). The FCC defines this service as "a fixed station operated by an educational organization and used primarily for the transmission of visual and aural instructional, cultural, and other types of educational material to one or more fixed receiving locations."[1] William J. Kessler underscores this definition to emphasize the unique purpose of ITFS: "ITFS is...a multi-channel, multiple address, point-to-point system providing _transmission_, not broadcasting, to any reasonable number of specific fixed locations...that may be cooperating in a bona fide educational effort."[2] ITFS is not one kind of instructional television; it is a means of transmitting televised instruction.

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[1] Federal Communications Commission, _Rules and Regulations_, Vol. III, Parts 73 and 74, Subpart I, Section 74.901. This definition of ITFS as a station rather than a service is repeated in other official reports of the Commission. Use of the term station conforms to the standardized definitions adopted by the International Telecommunications Convention of 1947 which defined specific communication services. The Frequency Allocations and Treaty Division of the FCC has subsequently adhered to the practice of employing the term station for all services not defined by the Convention.

[2] William J. Kessler, _Instructional Television Fixed Service: An assessment of technical requirements_ (Washington, D.C.: National Education Association, 1967), p. 1.

Characteristics of ITFS

As just one element in the total spectrum of educational communications ITFS complements broadcast television and closed circuit television (CCTV). It is necessary, therefore, to situation a study of ITFS in the context of the technical characteristics, historical development and current state of the art of educational telecommunication. The unique rôle of ITFS in this context may be summarized briefly-as follows:

1. ITFS provides multi-channel capability. The FCC allocations plan provides for a group of four channels or more to be assigned to each qualified applicant.

2. Spectrum space allocated to ITFS licensees may be used not only for video but for both voice and data transmission.

3. The FCC has since May 1969 authorized the use of the 2686-2690 MHz band for response channels within an ITFS system. In a more recent ruling of March 1970 the Commission has authorized data transmission on these response channels.

4. Because ITFS is not subject to rigid FCC regulation in the same way as broadcast television is, educators are free to experiment via ITFS with the medium of television.

5. At the same time, the system operates on VHF-UHF broadcasting standards to the extent that regular VHF receivers may be used for reception.

6. Although the primary purpose of ITFS is direct instruc-

tion, licensees may also use their facilities for transmission of administrative material, informal instruction and special training material.

7. ITFS is relatively economical because it is not subject to the same high technical requirements of broadcast television, because of the design of both the transmission and the receiving equipment, and because costs may be spread over a wide user base.

8. Since both transmission and reception equipment are in the hands of the user ITFS is essentially a private system.

9. Since the permissable power output of the transmitters has been nominally fixed, though not specifically limited at 10 watts for all applicants, the same channel groups may be reassigned to adjacent geographical areas without serious interference effects.

10. Specific allocation of channels is based not on a rigid allocations plan but on reasonable channel interference criteria, taking advantage of intervening terrain, directional antennas and other interference reducing techniques.

11. Allocation of ITFS channels for school systems and colleges relieves the demands of educators for in-school access to limited broadcast frequencies.

12. Because the receiving down-converter converts the four channel group from microwave to VHF signal, the system may be expanded by adding only 2500 MHz transmitters.

The greatest constraint of ITFS is the inherent problem of channel limitation. The essence of the system relies on spectrum conservation; effective spectrum utilization, in turn, demands both critical engineering design and coordinated development of ITFS on a regional and local level.

Purpose of study

It is now nearly six years since the authorization of ITFS by the FCC. The quantitative growth of the system has not to date equalled the high hopes of its early supporters, but growth has been steady and, in the past months, has taken on new direction and perceptible acceleration. At present, 65 ITFS systems are on the air, representing 120 stations or 290 channels.[1]

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[1] The term system in this study refers to all stations, originating or relay, allocated to a single licensee. A station, in FCC terminology, refers to a group of one to four channels allocated to a single licensee; one organization or institution may hold permits for only one station in a given locale but, by use of relay stations, a system may vastly extend the coverage of a single originating station. In this case, a second station, or group of channels, may be allocated to the same licensee but at a different location. A station is referred to by call letters, e.g. UHZ-61. A channel is one six-MHz wide band within a station grouping. One station may include up to four channels, but many licensees choose to apply for fewer than the four channel limit. Channels are referred to by a letter and number which correspond to the placement of that band within the table of 31 channels allocated for ITFS, eg. A-1 corresponds to the 2500-2506 MHz band. Response channels in the 2686-2690 MHz band are similarly designated A-1 through H-e. [Cf. Appendix for tables of channel allocations.] The terms "station" and

Of greater significance is the qualitative growth of ITFS. Has ITFS been permitted to alter conventional instructional methodology? How have educators taken advantage of the experimental possibilities of the medium? To what extent have users exploited the unique features of 2500 MHz television? To answer these questions, this study has set the following goals:

1. To outline the legal and technological status of ITFS.
2. To identify the uses to which ITFS is being put as a part of instruction.
3. To survey the quantitative status of ITFS systems.
4. To assess the extent to which ITFS has proved viable as one medium of communication in currently operating ITFS systems.
5. To define trends, problems and strengths of the operating systems and, as far as possible, of the applications now being processed by the Commission.
6. To analyze critically the future direction of ITFS as an instructional medium.
7. To identify and describe innovative applications of the medium of ITFS.
8. To determine the unique capabilities of ITFS within the perspective of educational telecommunication.

"channel" as applied to ITFS do not correspond to the traditional usage of these terms in broadcast television; much of the ambiguity and misinformation regarding the development of ITFS may be traced to semantics.

Relevance of study

Several factors prompt this study and make it timely. First, the number of ITFS systems now operating is large enough to make a substantial impact in the total context of instructional television. Many of these facilities have now been operating for several years, long enough to encounter and solve problems, to make valid predictions, to determine staff, equipment and programming needs.

Secondly, from a technological standpoint, ITFS has matured in both quality and scope. Several innovative techniques have been incorporated in existing ITFS systems: e.g computer-based allocations plans, extensive use of response channels for voice transmission at Stanford University, touch-tone response experiments in the Brooklyn diocesan schools, the use of ITFS channels for dial access systems, programmed instruction and transmission of administrative data. New organizational patterns have also emerged as solutions to both technological and educational problems: e.g. the public utility concept incorporated in the Cleveland area plan, college and university consortia, and distribution of educational resources to industrial and medical personnel for pre- and in-service training on location, and cooperative plans among interest groups such as the Catholic diocesan school systems.

If ITFS is to fulfill a unique role in concert with other media for communication, these techniques and organizational structures must be first evaluated and, if successful, made known to the educational community and to prospective users of 2500 MHz television

At the same time, however, the future of these reserved channels is jeopardized. In some geographic areas, the problem of spectrum saturation is imminent; engineering errors and lack of coordinated planning threaten both present and prospective users. This constraint demands serious consideration of priorities in channel allocation, of more stringent FCC regulation of ITFS facilities, of possibilities for regional and local coordination, and of alternatives to 2500-2690 MHz distribution.

Of immediate concern are recent actions by the FCC in granting ITFS allocations. On November 25, 1969, the Commission granted authority to the Metropolitan Police Department of St. Louis, Missouri, to construct and operate television facilities on Channel 2650-2656 MHz within the ITFS band. Though the Police Department proposes to use the facilities for educational material including in-service training and formal educational courses for police officers, the authorization is in direct conflict with the original FCC Report and Order concerning ITFS which restricted eligibility for licensing to institutions and organizations primarily engaged in formal education and specifically excluded from eligibility groups engaged in public safety and welfare activities.

Moreover, the Commission has in recent months received applications from two additional industrial corporations, the Dow Financial Corporation and United Airlines, for authority to construct and operate industrial television facilities in the 2500-2690 MHz band. Unlike the St. Louis Police Department, these applicants propose no educational application of the channels requested.

Necessity for state of the art study

Problems of saturation and priorities, combined with the catalyst of pending industrial applications, have brought to a head a problem that has long existed. When the FCC established ITFS it was on an experimental basis; before the reservation of the band could be regularized a study was [illegible] be taken to determine and evaluate the effectiveness of the use by education of the reserved channels. In order to protect the interests of education as well as the interests of existing industrial users of the band, the Commission ruled in its Report and Order on Docket 14744 that,

> because we have no firm foundation on which to evaluate the ultimate needs of education for the proposed service a reallocation of the 2500-2690 Mc/s band from the operational fixed service to instructional television is not being enacted at this time. Instead, the

> Commission is providing a three-year period during which no new operational fixed systems will be authorized in the 2500-2690 Mc/s band....During this three-year period, the Commission will observe the amount of use of these channels by educators and will determine what course of action should be taken to encourage the fullest development of the 2500-2690 Mc/s band.1

This review by the Commission has never been conducted. The Committee for the Full Development of ITFS, an advisory body appointed by the FCC and composed mainly of educational broadcasters, has repeatedly expressed concern over this delay and has taken steps to authorize and encourage both a study and the regularization of ITFS, but the Committee has no authority, no resources and no mandate to act. At present, a freeze has been placed on further allocation of 2500-2690 MHz frequencies to commercial users, but further steps toward the regularization of ITFS await a thorough study of the educational and technological development of these channels by education.

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[1] Federal Communications Commission, Docket No. 14744, Report and Order, FCC 63-722, adopted July 25, 1963, p. 6.

Methodology

Review of the Literature

Research in ITFS

The present study is limited to ITFS as a method of transmission of televised instruction; the aspect of television as an instructional medium is considered only as it relates to the development of ITFS. There is virtually no scholarly research in existing literature which treats of this subject. The limited writings about ITFS are strictly of a popular style, designed to encourage the development of the system or to describe activities of specific institutions in the development of their systems; none treats with any depth the educational or technical state of ITFS as a system.

Donald F. Mikes, now of the Department of Audiovisual Instruction, National Education Association, prepared an M.A. research paper covering the historical development and technical capabilities of the 2500 MHz television.[1] In 1967 Dr. Bernarr Cooper of the New York State Department of Education, Dr. Robert Hilliard of the Educational Broadcasting Branch of the FCC, and Dr. Harold Wigren of DAVI, edited a booklet entitled ITFS: What it is...How to plan.[2] This booklet, published by the National Education Association, was designed to acquaint prospective users with the rudiments of ITFS as a means of transmission and to outline the steps in development of an ITFS system. William J. Kessler, a professional engineer, has studied the technical requirements of ITFS, including in his study formulae for cost determination and a thorough discussion of technical requirements.[1]

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[1] Donald F. Mikes, "The development of the Instructional Television Fixed Service (unpublished M.A. paper, University of Maryland, April 22, 1969).

[2] Bernarr Cooper, Robert Hilliard and Harold Wigren, eds., ITFS What it is...How to plan (Washington, D.C.: National Education Association, 1967).

Several directors of ITFS facilities have written descriptive articles on their own systems; these have proved valuable in studying the day-to-day operation and immediate goals of specific operations. Other educators, most notable Father John M. Culkin, S.J., of Fordham University, have written popular-style articles expounding the virtues of 2500 MHz television.[2]

In general, ITFS is given cursory treatment, if any, in general studies of educational and instructional television. It is significant to note, for example, that in his comprehensive history of instructional technology, Saettler omits any mention of 2500 MHz television, although he devotes an entire chapter to the development of instructional television.[1]

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[1] Kessler, Technical Requirements. Also, Fundamentals of television systems, Seminar on Learning and Television sponsored by the National Association of Educational Broadcasters, National Project for the Improvement of Televised Instruction, June 27-July 15, 1966 (Washington, D.C.: National Association of Educational Broadcasters, 1966).

[2] John M. Culkin, S.J., "ETV stations for the asking," Catholic Property Administration, XXVII (December 1963), 28; "A new kind of television," Catholic Education, XXXVI (January 1966), 136. Cf. Bibliography for complete list of references.

Research in Educational Television

In order to place ITFS in perspective it is necessary, therefore, to look to related sources of information. There are several authoritative histories of the development of educational television (ETV) and instructional television (ITV). Richard Hull traces the history of ETV to 1962 in Educational television: The next ten years.[2] Beverly J. Taylor, when an FCC staff member, offered an even more comprehensive historical review covering the period to 1967.[3] Dr. Frederick Breitenfeld, Jr., Executive Director of the Maryland Center for Public Broadcasting, prepared a state of the art of instructional television study in 1968, including in his study a review of ITFS.[4] Studies of closed-circuit television, including two comprehensive studies conducted under the auspices of the National Education Association[1] and an historical review by Gary Gumpert[2] are also germane to the present study.

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[1] Paul Saettler, A history of instructional technology (New York: McGraw-Hill, 1968).

[2] U.S. Department of Health, Education, and Welfare, Educational Television: The next ten years (Washington, D.C.: Government Printing Office, 1965). Originally published by the Institute for Communication Research, Stanford University, Stanford, California, 1962.

[3] Allan E. Koenig and Ruane B. Hill, The farther vision: Educational television today (Madison: University of Wisconsin Press, 1967).

[4] Frederick Breitenfeld, Jr., Instructional television: The state of the art, report prepared for the National Commission on Instructional Technology and the Academy for Educational Development, 1968.

These historical studies are important for two reasons: 1) By demonstrating the development of ETV and ITV they idicate the reasons for ITFS and the role it was designed to play as an answer to problems encountered by CCTV and broadcast ITV, and 2) They offer a bsis on which to judge the relative impact of ITFS within the total telecommunications context.

Also relevant is a study of the instructional aspects of ITFS, i.e. the various aspects of television as a medium of instruction, without regard to the method of transmission. The literature in this area abounds. Several authors have compiled and reviewed research in instructional television;

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[1] Lee E. Campion and Clarice Y. Kelley, eds. A directory of closed-circuit television installations in American education with a pattern of growth, report prepared for the Technological Development Project of the National. Education Association, Studies in the Growth of Instructional Technology II, Occasional Paper No. 10 (Washington, D.C.: Department of Audiovisual Instruction, National Education Association, 1963); Department of Audiovisual Instruction, National Education Association, A survey of instructional closed-circuit television, 1967 (Washington, D.C.; Department of Audiovisual INstruction, National Education Association, 1967).

[2] In Koenig and Hill.

notable among these are Kumata,[1] Schramm and Chu,[2] Holmes,[3] MacLennan and Reid.[4] Saettler notes that "instructional television has probably been subjected to more research than any other instructional innovation."[5]

A vast majority of the studies are instigated to determine the relative effectiveness of teaching by television as compared with conventional classroom techniques. Maloney observes that

> Literally hundreds of studies demonstrate that students can learn French, military courtesy,shorthand and typing, psychology, and so on, about as well by television as they can in the classroom; and that they can, moreover, learn these subjects in various times of day and at various educational levels just as they might in the classroom. The phrase, "no significant difference," as used in these studies after a time becomes a cliche with positive overtones of humor.[6]

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[1] Hideya Kumata, An inventory of instructional television research (Ann Arbor: University of Michigan, Educational Television and Radio Center, 1956).

[2] Wilbur Schramm and Godwin C. Chu,Learning from television: What the research says (Washington, D.C.: National Association of Educational Broadcasters, 1968).

[3] Presley D. Holmes, Jr., Television research in the teaching-learning process (Detroit: Wayne State University, Division of Broadcasting, 1959).

[4] Donald W. MacLennan and J. Christopher Reid, A survey of the literature of learning and attitude research in instructional television (Columbia: University of Missouri, Department, Department of Speech, 1962).

[5] Saettler, p. 227.

[6] Koenig and Hill, p. 13.

Maloney's lack of enthusiasm for research in ETV is echoed by John M. Kittross:

> Educational television research for the most part has ignored the problems of ETV, has been redundant and poorly planned, and has suffered from the fact that potentially useful findings often are ignored by the administrators and specialists who must implement them.[1]

As early as 1961 Kumata, in evaluating the research in educational television, lamented the same problem:

> If we were to characterize the research done, I think four points would stand out. First, no particular theoretical framework has been apparent in most of the studies. Almost all of the studies have been of an applied nature....Further, there has been very little dependence on prior research. Second, the overwhelming majority of these studies have been what we call "comparability" studies, and almost all of these have been comparisons of television versus face-t0-face instruction. Very few studies have been done as comparisons of radio, film, and television. Third, almost all of the main dependent variables in these investigations have been some measure of students' information gain....Most examinations have been in the nature of requests for students to reproduce information previously supplied by the instructor. Fourth, most research in instructional television has been done in the classroom situation with regularly enrolled students....Research has concentrated upon the captive audience aspects of educational television.[2]

Six years later, in spite of extensive research conducted with federal government funding, Saettler is squally skeptical:

> One of the fundamental problems of instructional media research, and of instructional television research in particular, is the lack of a theoretical framework for testing hypotheses. It seems clear that much work needs

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[1] *Ibid.*, p. 234.

[2] Report presented at the International Seminar on Instructional Television, October 8-18, 1961, Purdue University, Lafayette, Indiana. Quoted in Saettler, p. 340.

> to be done by researchers in developing a theoretical structure for their experiments before educators can begin to develop a scientific technology of instruction.[1]

FCC documentation

To trace the historical development of ITFS, then, the researcher's first task was to identify and locate all existing ITFS material within the files of the FCC. This material includes complete information relating to Rule Makings concerning the 2500-2690 MHz band reserved for ITFS: Notice of Proposed Rule Making, Report and Order, and testimony submitted to the Commission. This collection of data was made more difficult by the fact that the Educational Broadcasting Branch handles applications for educational use of the band while the Safety and Special Services Branch handles matters relating to commercial and industrial use of the band. All records and correspondence pertaining to applications from educational institutions and organizations for ITFS permits was also studied.

The review of FCC records provides official documentation of the development of ITFS, proposals and comments prepared by applicants, testimony from interested parties including manufacturers, engineering consultants, broadcasters, educators and administrators. The official reports are devoid, however, of current information regarding the utilization of ITFS by education. Since this study is of the state of the art of ITFS, not merely a history of its development, the official records and published literature are complemented by both personal interviews and by a survey of ITFS applicants and permittees.

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[1] Ibid., p. 343

Interviews

A major primary source of information for this study is a series of interviews which were conducted throughout the country with representative groups of persons involved in ITFS development. During the period extending from August 1969 to April 1970 a total of 37 persons were contacted and interviewed in person. In order to achieve a balance of opinion and breadth of information, these individuals represent a variety of areas related to the study:

1. Staff members of the FCC.
2. Directors of ITFS installations.
3. Applicants for ITFS permits.
4. Members of the Committee for the Full Development of ITFS.
5. Consulting engineers.
6. Manufacturers of ITFS equipment.
7. Individuals involved in the early development of ITFS.
8. Administrators of institutions and systems using ITFS.
9. Executives of national organizations involved with the development of ITFS.

Various methods were used to identify and locate these resource people. A search of the literature provided the names of individuals who have written about ITFS in general or about their own facilities; FCC files provided the names of directors of individual facilities; each person interviewed was asked in turn for suggestions of other resource persons. This last technique proved to be the most valuable source of information because individuals immediately involved in ITFS were able to make value judgments in offering their suggestions.

The structure of these interviews following a similar basic pattern. With the exception of Dr. Robert Hilliard, Chief of the Educational Broadcasting Branch of the FCC, each person, when requested, agreed to be interviewed on tape. All of the taped interviews were later transcribed verbatim. These tapes, which represent a rich depository of information and commentary relating not only to the educational and technical aspects of ITFS but to broader concerns of instructional technology within the framework of American education, will be preserved for future researchers who may wish to study related areas of concern.

Each person was asked the same core questions. Almost all interviews lasted over one hour and several extended to three or even four hours. Much of the raw data for the present study is found in the transcriptions of these discussions. The data and the conclusions provided by the persons bridges the vast gap between the slim volume of written material available and the present status of ITFS development.

The fact that the present study represents original research in a previously unexplored area is underscored by the fact that the interviewees indicated that they had not previously been contacted by any person conducting research on ITFS development; the majority added that they were pleased to learn that the present study had been undertaken, emphasizing their support through their candor and their total cooperation.

Survey

Documentation for the present study has been complemented by information obtained directly from present and prospective ITFS users through a national survey of ITFS systems. This survey was undertaken in order to provide the information needed for an assessment of the instructional application of ITFS, the technical design of ITFS systems, patterns of staff, equipping, funding and programming, and administrative practices relating to the development of ITFS. A secondary purpose of the study is the compilation of a complete and accurate directory of ITFS installations, their location, directors and current level of operation. This information in included in Part II of the study.

The survey also includes descriptions of innovative practices inaugurated by individual systems in the development of ITFS as an instructional medium. This factual information, previously uncollected, provides the basis for conclusions regarding the technical and educational state of the art of ITFS.

The population for this study is, by necessity, the total number of ITFS installations and applicants. In February, 1970, the FCC Educational Broadcasting Branch reported that "ninety-nine [ITFS] systems with 237 channels were on the air in January 1970, and 58 systems with 194 channels had outstanding construction permits."[1] A careful study of FCC records indicates, however, that this figure is somewhat in error. In actuality, there are 65 systems operating, representing 120 stations and 290 channels on the air. Twelve of these 65 operating systems hold construction permits for expanded facilities, totalling 12 additional stations or 81 additional channels. In addition, 14 systems which currently hold construction permits have not yet gone on the air; these 14 systems represent 20 stations or 59 channels.

The population for this study includes the 79 systems for which construction permits or licenses are now held; the remaining allocations and pending applications represent not systems but relay channels and/or additional channels for existing systems.

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[1] "Instructional Television Committee to Hold First 1970 Meeting on February 27 in San Francisco," Public Notice FCC-44558 (February 10, 1970), 1.

FCC records provided the names and addresses of licensees and applicants. The information in the official files was based, however, on data submitted at the time of the original application. In a majority of cases, the name listed in FCC files, duplicated in official studies and directories, was not that of the person now responsible for the ITFS system. In spite of this fact, the first mailing of the survey questionnaire on February 15, 1970, brought 58 responses from a population of 82. During the first two weeks in March a second mailing was sent to 24 systems which had not responded; in many cases, this follow-up correspondence was sent to a different addressee. In some instances research was undertaken to determine the name of the school superintendent or college president when the name provided in the FCC files was out-of-date.

Those systems which had not responded by the end of March were telephoned individually and supplied with Special Delivery return envelopes. The latter strategy was designed to compensate for the Post Office strike which occurred during the month. A total of 33 telephone calls were made to request a response or to clarify questions raised by the first response. Those 14 systems which had not replied to the questionnaire were telegraphed on April 5, 1970.

In addition, 35 letters were mailed as follow-ups to incomplete responses. Several returned forms omitted a single item, presumably by oversight. The follow-up mailing produced 100% results.

Finally, the FCC files were again searched. A meeting with the staff members of the Commission responsible for processing ITFS applications was arranged on April 10, 1970, in order to re-confirm the data obtained and to insure that no member of the survey population had been inadvertently omitted from the study.

The survey of ITFS systems has provided information in several areas of this study: 1) The raw data is presented in Part II of this study, including profiles of each system, summary of the survey results and a directory of systems and their directors; 2) Information regarding innovative applications of ITFS is included in Part I, Chapter V; 3) All references to number of channels allocated, stations on the air and related data is based on the information collected from individual systems rather than from information provided by the Commission; 4) All graphic presentations of growth patterns, funding and staffing patterns, utilization and equipment are based on empirical data obtained from the survey.

Summary

The conclusions presented in this study, therefore, are based on a review of the related literature, both published and unpublished, and on extensive interviews with appropriate individuals involved in the development of ITFS, and on a national survey of all presently operating ITFS systems and of those prospective systems which have applied for FCC construction permits.

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PART I

Chapter I

Education Establishes a Need for Instructional Television Channels

Definitions

Instructional Television Fixed Service is one method of distributing televised instruction; instructional television, in turn, is one aspect of a greater sphere of educational television. A definition of terms is preliminary to further discussion of ITFS. As defined by Koenig and Hill, educational television is a medium

> which disseminates programs devoted to information, instruction, cultural or public affairs, and entertainment. The word medium connotes any means employed to transmit an educational program .... ETV is a broad term encompassing all types of educational programing.[1]

Instructional television (ITV), on the other hand, is a more exclusive term. As defined by Carpenter and Greenhill, instructional television

> is understood to refer to educational efforts using television which have as their purposes the production, origination, and distribution of instructional content for people to learn; efforts in which television is used as the principal or as an auxiliary medium of communication. This conception includes closed-circuit broadcast activities ... which handle information specifically organized and produced for learning. The scope of

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[1] Koenig and Hill, Preface, p. xi.

> instructional television is more specific than that of educational television and very different from commercial television .... Instructional television is closely related to the work of organized formal educational institutions.[1]

To further clarify this definition of the term, however, Carpenter and Greenhill caution:

> In one sense *instructional* television is a misnomer; television *per se* does not instruct, it does not educate, it does not learn. Television itself is a *tabula rasa*, a blank sheet or a clear channel. It is a *potential* mediator of instruction, it is an instrument, which may be used to provide some but not all of the conditions necessary for most kinds of learning to occur.[2]

Components of ITV system

In their definition of instructional television Carpenter and Greenhill have listed the components of an instructional television system: production, origination and distribution of instructional content. William Kessler, in his study of *The Fundamentals of Television Systems*, further explains the components of an ITV system.

1. *The origination facility*

   The basic function of the origination equipment is to convert the picture or scene to be transmitted into analog electrical signal variations suitable for transmission over wire or radio circuits....

2. *The transmission facility*

   The transmission facility may consist of either wires

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[1] *ETV: The next 10 years*, p. 286.

[2] *Ibid.*, p. 288.

> in the form of a suitable coaxial cable or a wireless radio circuit to transport the signals which represent the picture information from the origination point to the destination point or points.
>
> 3. The reception/display facility
>
> The reception/display facility is the final link in the complete system and is ... the black-box with the cyclop eye which converts the received signals (which only represent the picture) into an accurate reproduction of the picture or scene at the origination point.[1]

Kessler includes a fourth element in his explanation of a basic television system: the recording/reproducing facility. "Although not necessarily an essential link in the television system *per se*, the recording/reproduction of picture for use with a television system or the recording/reproduction of television signals proper has become an essential parallel function at the television origination point as well as the destination point."[2]

The basic purpose of television is to reproduce images and associated sound instantaneously at distant locations; the transmission of the electrical signals corresponding to the picture and sound information, then, is the essential link in the complete system. There are three methods of transmitting television signals: 1) closed circuit, 2) broadcast, and 3) 2500 MHz television. Since ITFS was specifically designed to complement closed circuit and broadcast television, to solve problems inherent in these other methods of transmission, it is necessary to describe briefly the technical characteristics of closed circuit and broadcast systems and to trace the historical development of educational and instructional television which led to the eventual reservation of the 2500-2690 MHz band for education.

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[1] Kessler, *Fundamentals*, pp. 1-2.

[2] *Ibid.*, p. 2.

Methods of Television Distribution

> To transmit any kind of intelligence by radio waves, a band of frequencies is required.... The width of the band required to transmit intelligence depends upon the type of intelligence or signal which is desired to transmit.[1]

All three types of transmission system must exhibit a given minimum transmission bandwidth or "frequency response" expressed in hertz per second. Bandwidth is the arithmetic difference between the lowest frequency and the highest frequency of an electrical signal used to represent a television image to be transmitted.

> The maximum signal frequency which is required to present the intelligence in a picture is very great. This is not surprising in view of the fact that "a picture is worth a thousand words" in convening intelligence.[2]
>
> Because of the high picture content and the rapid rate (30 complete pictures per second, or frames per second) at which the picture information is transmitted to provide the illusion of smooth motion, a relatively broad

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[1] _ETV: The next 10 years_, p. 216.

[2] _Ibid._, p. 217.

> frequency response or bandwidth requirement is imposed on any transmission system. The video bandwidth requirements are directly related to the picture detail required in the reproduced image.[1]

More specifically, "U.S. broadcast standards, which are a compromise between acceptable picture detail and bandwidth conservation, have limited the maximum frequency of the video bandwidth to less than 4.5 mc/s."[2, 3] To this video bandwidth must be added the audio channel to provide a talking picture rather than a silent picture. "A video bandwidth of about 4.2 mc/s is the practical limit to avoid interference between the picture and sound signals."[4] Thus, a television channel is 6 MHz wide, with a 4.5 MHz band required for the picture signal and the remaining 1.5 MHz "allocated to the program sound channel and so-called 'guard bands' to eliminate interference between the picture and sound signals as well as adjacent television channels."[5]

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[1] Kessler, Fundamentals, pp. 16-17.

[2] Ibid., p. 17.

[3] Note: In this passage from Kessler, and in other earlier writings, the term cycles per second (c/s) is used to express frequency response. The synonymous term hertz (Hz) has subsequently been adapted in the U.S. to conform to international terminology.

[4] Kessler, Fundamentals, p. 17.

[5] Ibid., p. 21.

Closed circuit television (CCTV)

"Closed circuit television refers to the procedure whereby the television signals are distributed from the origination point to the reception points by means of coaxial cable."[1] Closed circuit television systems range from statewide systems, e.g. the ITV systems in South Carolina and Delaware, to single building installations. The cable system may be installed by the telephone company and used by the organization on a rental basis; it may be installed, owned and operated by the user institution; or it may be installed and operated by a community cable company (CATV). Technically, the term CCTV is applied to systems which include origination, distribution and reception; as Breitenfeld notes, however:

> A closed-circuit distribution system may also include only an antenna, attendant transformers, other hardware, cables and the usual reception points. Here, the origination of the signal can take place beyond the building, and the antenna itself acts as the source of signal for the system. This is ... more accurately a simple "internal distribution" system.[2]

Coaxial cable transmission systems fall into two basic categories: 1) video systems, and 2) RF systems. In a video system video signals are transmitted "in the raw form as they emerge from the originating studio.... The associated program audio is generally transmitted over ordinary pair of telephone wires following generally the same geographical routes as the coaxial cable."[1] Such an arrangement may be used in television studios where distances are short and maximum detail is required in the pictures. It is not practical, however, for two reasons: 1) Only one program at a time may be transmitted on the cable, and 2) special video monitors and audio systems are needed. Video (or direct) transmission "does not take advantage of the full transmission capability of coaxial cables."[2] In an RF system, on the other hand,

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[1] ETV: The next 10 years, p. 321.

[2] Breitenfeld, Instructional Television, p. 1.

> The video and audio frequencies from the camera and control consoles may be fed into an audio-video mixer and used to modulate a radio-frequency carrier wave. The mixer is a small transmitter and sends the picture and sound signals over a coaxial cable on one of the VHF channels (2-14).[3]

Since several RF signals can be carried on one coaxial cable it is possible to broadcast simultaneously on several channels.

> Since programs are transmitted ... exclusively to a particular audience that must be especially equipped to receive them, closed-circuit television falls outside the jurisdiction of the FCC, which regulates only the scarce, limited channels of the public air space.

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[1] Kessler, Fundamentals, pp. 18-19.

[2] Ibid., p. 19.

[3] ETV: The next 10 years, p. 321.

> There is relatively unlimited access to channels in the CCTV spectrum.[1]

Broadcast (UHF and VHF)

Broadcast television, also called "open circuit" television, operates on radio frequencies allocated by the Federal Communications Commission (FCC), the government agency responsible for the radio spectrum. The FCC grants broadcast licenses to commercial and non-commercial users on a one signal per licensee basis. One broadcast channel represents a 6 MHz bandwidth within the radio frequency spectrum.

> The radio frequency spectrum extends continuously from a few thousand cycles per second to several tens of billions of cycles per second. Various parts of this continuous spectrum have received rather arbitrary designations. The region from 30 to 300 million cycles ... is known as the very high frequency (VHF) region. That from 300 to 3,000 Mc is known as the ultra high frequency region (UHF). The channels assigned to television broadcasting are located in these two regions.
>
> The 13 channels originally assigned by the Federal Communications Commission to commercial television broadcasting were all in the VHF region. As the demand for channels increased, the number available in the UHF region was found to be inadequate and in 1952 the FCC allocated the space in the UHF region between 470 and 890 Mc to an additional 70 channels.[2]

On a television receiver, the VHF channels are received on channels 2 through 13; UHF channels are channels

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[1] Schramm and Chu, Learning from television, p. 22.

[2] ETV: The next 10 years, pp. 321-22.

14 through 83. The following table indicates the location of specific channels and frequency ranges:[1]

Channel numbers	Frequency range	Region
2-4	54-72 MHz	Low-band VHF
5-6	76-88 MHz	Low-band VHF
7-13	174-216 MHz	High-band VHF
14-40	470-632 MHz	Low-band UHF
41-83	632-890 MHz	High-band UHF

As indicated in the table, while the channel numbers are consecutive, the frequency ranges are not. The intervening spectrum space is occupied by a variety of other services including military communication, FM broadcasting, mobile two-way radio and other radio services.

Historical Development

Early Development

In his historical overview of CCTV in education, Gary Gumpert observes that "the beginnings of broadcast and closed-circuit television are one and the same; later their paths diverged."

> In first demonstrating the transmission of television over substantial distances, in 1927, the Bell System used wire line for transmission between Washington and

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[1] Adapted from Tables in ETV: The next 10 years, p. 222 and Kessler, Fundamentals, p. 22.

> New York, and radio link for that between Whippany, New Jersey and New York. The wire line transmission was closed circuit.[1]

The first educational application of television was demonstrated at the University of Iowa in 1932. The Department of Electrical Engineering constructed an elementary closed-circuit television demonstration unit for the University's exhibit at the Iowa State Fair. Building on this beginning,

> The Western TV Company of Iowa donated equipment needed by the University to be a leader in electrical communications and a pioneer in ETV.... On September 10, 1931, the university applied to the Federal Radio Commission for a construction permit. This was issued January 9, 1932, and the station was licensed May 27, 1932. On January 25, 1933, the new station, W9XK, in Iowa City, joined the facilities of the university's AM radio station, WSUI, to transmit its first formal "sight and sound" broadcast.[2]

The Daily Iowan described the historic event in the following report:

> Directed by Professor E. B. Kurtz, head of the department, the program included a sketch from a university play, a violin solo, a lesson in freehand drawing, and an illustrated lecture. This performance took place on the ground floor of the building, with the radio and television receivers bringing the scenes before the two groups on the top floor.[3]

While Iowa State, using a mechanical scanning device, continued to broadcast educational programming for more than seven years, educational applications of the new medium of television were scattered during the 1930's. Some institutions, e.g. Purdue and Kansas State Universities, held experimental television licenses, but in general education "did not share the vision" of the manufacturers, broadcasters and advertisers with regard to the potential of television. Education, in the opinion of Richard Hull, "had not pursued the potentials implicit in the Iowa experiments.... Whether television had any role in education, much less the nature of the role, remained to be determined."[1]

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[1] Koenig and Hill, p. 159.

[2] Ibid., p. 134.

[3] Ibid., pp. 160-61.

World War II altered the role of education in television in two ways: first, the War produced technical advances and general developments important to the technology of television; second, the universities were called upon to educate both the engineers and the broadcasters necessary for expanded television production. Taylor writes, for example, that

> One of the first universities to engage in TV training was the University of California at Los Angeles which, in February 1941, offered a short course in television production and acting as part of the Extension Division curricula. The University of Ohio introduced two courses specifically for radio and pictorial journalism in 1944. In 1945 the General Assembly of the State of Iowa appropriated $525,000 for the University of Iowa to develop a communications center to house journalism, publication, visual education and radio-TV.[2]

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[1] ETV: The next 10 years, p. 334.

[2] Koenig and Hill, p. 135.

Further evidence of expanding interest in television as an educational medium was the testimony of educators at FCC hearings held in 1944 "to enable the radio art to take advantage of the important wartime technical advances ... and to facilitate orderly planning for postwar development." Though educators advocated the reservation of television channels specifically for education, the FCC final report concluded:

> With respect to immediate television development ... it does not appear that the current educational interest in television or in the probability of the multiplicity of ETV stations in the near future is sufficient to warrant reserving television channels.... If at any future date, educational institutions believe there is sufficient education interest in television and sufficient probability of developing useful ETV services, the matter can be raised anew at that time.[1]

During the years immediately following the FCC ruling the growth of educational television was slow but definite. Some institutions, e.g. Syracuse University, American University and the University of Michigan, produced educational programs for broadcast over commercial channels. Other institutions, e.g. Michigan State University, worked with closed-circuit television instruction. Taylor cites the following examples of activity in the area of educational and instructional television:

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[1] Federal Communications Commission Docket No. 6651, Report and Order, adopted January 15, 1945, p. 83. Quoted in Koenig and Hill, pp. 135-36.

> One of the first extensive in-school ITV series was inaugurated with one program a week by the Philadelphia public school system in 1947 in cooperation with WPTZ, WFIL and WCAU. By the early 1950's the service had increased to thirteen programs a week serving over 60,000 students.
>
> The Nutley, New Jersey, high school introduced TV as a permanent part of its regular school program in the 1947-48 school year when a large screen receiver, TV cable equipment, and closed-circuit facilities were donated by Industry TV, Inc.[1]

Iowa State University, station WOI, was the first television station owned by an educational institution and operated on commercial channels.[2] The University of Texas had in 1940 pioneered with a state-wide program entitled "Radio House". Originally an extracurricular project, Radio House in 1948 added television and, by 1950, had grown into a part of the University's College of Fine Arts.[3] These and many other individual endeavors testify to the variety of uses to which television was being put in instruction. The interest of education, however, was strictly on an individual basis; there was at this time no national consensus or effort by education in behalf of ETV.

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[1] _Ibid._, p. 137.

[2] _Ibid._, p. 167.

[3] _Ibid._, p. 138.

Development of Educational Television (ETV)

In September 1948 the FCC placed a "freeze" on television channel allocations. The freeze was designed to give the Commissioners time to complete hearings on a nation-wide television channel allocation system. Up until this time the Commission had issued 134 authorizations for standard television stations.

> Of these, seven were licensed to operate, 33 were actually in operation pending final licensing, and two experimental stations were operating commercially under special permission. Television receiving sets were being produced at the rate of 58,000 per month.[1]

Only one of these television stations, WOI-TV at Iowa State, was licensed to an educational institution. Wilbur Schramm, then of the University of Illinois and a long-time observer of educational television, commented later that

> In some respects, it was a blessing to ETV that the Commission froze allocations for two years. This provided time to alert education and civic organizations to the opportunity TV offered.[2]

Allerton Conference

In 1949 Schramm, Dean of the University of Illinois Communication Center, enlisting the support of the Rockefeller Foundation and of Dr. George Stoddard, President of the University, called a conference of educational broadcasters from Canada, Great Britain and the United States at Allerton House, the University of Illinois Continuing Education Center. It was at the Allerton Conference in 1949, according to Hull, that

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[1] ETV: The next 10 years, p. 339.

[2] Schramm, Wilbur. The people look at television (Palo Alto, California: Stanford University Press, 1963), p. 5.

> these men began to develop a real synthesis of purpose and to spell out a practical working philosophy which could be widely understood and supported. Here too, many of the individuals who subsequently fought for educational television channel reservations and became key figures in the educational television movement, met each other for the first time. The functional plans for a nation-wide educational radio broadcasting network were developed at this seminar, and later these same concepts provided the basis for a nation-wide educational television network and program center.[1]

When the FCC issued its Notice of Further Rule Making in July 1949 it included a revised plan for television channel assignment, with no mention of reserved channels for education. Commissioner Frieda Hennock, in a dissenting opinion, proposed that part of the UHF band should be reserved for educational use.[2] Commissioner Hennock thus

> provided the legal and moral platform on which the educational establishment was subsequently to act; she also became the "mother protector" image of the educational television movement, perhaps its most widely known advocate and an effective champion of almost fanatic zeal.[3]

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[1] ETV: The next 10 years, p. 340.

[2] Saettler, p. 228.

[3] ETV: The next 10 years, p. 34.

In his history of educational television, Richard Hull, then President of the National Association of Educational Broadcasters, recalls the controversy over these reservations:

> The Commission, having heard testimony in support of its new allocations plan, then established a late summer deadline for the filing of protest petitions. Unhappily, the date coincided with the time when activity in most educational institutions is at its lowest ebb and when most educational administrators are vacationing. However, Cohn and Marks, attorneys for the National Association of Educational Broadcasters, at the request of its president, immediately filed a petition asking for permanent educational reservations in the Ultra High Frequency (UHF) television spectrum, a position promptly supported by co-filings from the Association of Land Grant Colleges and Universities, the Association of State University Presidents, and by the National University Extension Association. Ohio State University's president, Howard Bevis, and Dr. I. Keith Tyler, alerted by the National Association of Educational Broadcasters, worked rapidly and under great difficulty to secure these supporting petitions in time to meet the Commission deadline.
>
> In late 1949 efforts to reserve television channels for education were finally achieving substantial momentum. The United States Office of Education had filed its own petition with the Federal Communications Commission asking that Very High Frequency (VHF) as well as Ultra High Frequency (UHF) channels be reserved for education, and the National Education Association joined in this plea. The issues now were no longer hypothetical ones. Exploitation of the UHF band in an indefinite television future was one thing. Actual and immediate designation of commercially valuable VHF channels for educational use was quite another, and a kind of structured opposition from some areas of the commercial broadcasting industry began to develop.[1]

Opinion was divided, however, as to the course that education should follow in its request for reserved channels.

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[1] Ibid., pp. 340-41.

While the U.S. Office of Education, the National Education Association and Commissioner Hennock demanded VHF reservations, the National Association of Educational Broadcasters, representing the educational broadcasters, had asked for UHF channels only. Koenig and Hill describe the basic conflict:

> By 1950, educators fully realized the potential of educational television. However, they were not organized as a unified educational body that could influence the FCC's decision on ETV frequencies. In fact, a number of different educational groups prepared petitions for the purpose of reserving ETV channels. Some of these pleas contradicted one another. For example, some educators wanted nonprofit educational television while others wanted noncommercial ETV, and still others wanted both. Thus one group did not want ETV to yield a profit, but would have found commercialism an acceptable means of support. The other group did not want any kind of commercials presented over ETV.[1]

Joint Committee on Educational Television

In order to bring the two sides together Commissioner Hennock invited a group to her home on October 16, 1950.

> This meeting proved to be a landmark in educational broadcasting because it marked the beginning of the Joint Committee on Educational Television[2].... The results of this meeting authorized the Joint Committee on Educational Television to make a presentation on behalf of the seven national organizations whose members were represented at the meeting (the Association of Land-grant Colleges, the Association of State University Presidents, the National Association of State Universities, the National Council of Chief State School Officers, and the National Education Association.[3]

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[1] Koenig and Hill, pp. 5-6.

[2] Now the Joint Council on Educational Telecommunications.

[3] Saettler, pp. 228-29.

The Joint Committee on Educational Television, which later came under the auspices of the American Council on Education,[1] agreed upon a strategy. The first task was to find educators who would testify before the FCC hearings, scheduled for the next month. It was agreed that the JCET would ask for at least one VHF channel in every metropolitan area and every major educational center as well as 20 per cent of the available UHF channels. The formula was based on an allocations system earlier devised for AM and FM radio stations.

During the first FCC hearings on television channel allocations held in November 1950 testimony was heard from 61 persons who favored the request for educational reservations.[2] The JCET further assisted 833 schools and colleges to present statements of intent to utilize educational channels.[3] Of a total of 76 persons testifying at the second hearings on television channel allocations on January 22, 1951, 71 supported the reservation of educational channels while five representatives of commercial television opposed the allocation of special channels, at the same time admitting that television could be potentially effective as an instructional medium.[4]

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[1] Koenig and Hill, p. 6.

[2] Saettler, pp. 229-30.

[3] Koenig and Hill, p. 139.

[4] Saettler, p. 230.

Fund for Adult Education

The formation of the JCET coincided, most fortuitously, with the establishment by the Ford Foundation in April 1951 of two semi-autonomous organizations: the Fund for the Advancement of Education, "concerned with problems and opportunities in formal education from elementary grades through college levels," and the Fund for Adult Education, "devoted to the development of methods and opportunities in adult education", further defined as "that part of the educational process which begins when formal schooling is finished."[1]

"Education for public responsibility" was the phrase used by the first and only Director of the Fund for Adult Education, C. Scott Fletcher. Fletcher, recruited for his position from Encyclopedia Britannica Films by the powerful directors of the Ford Foundation, Paul G. Hoffman, Robert Hutchins, and Chester Davis, assumed his position on April 5, 1951.[2] Fletcher's aims were explicit: (1) to create awareness of the major elements and issues of the modern culture, (2) to develop concern with them, (3) to develop materials for their study, (4) to institute activity in learning among them, and (5) to encourage association of adults in such activity. "In order to reach effectively as many citizens as possible," Fletcher maintained; "a program of liberal adult education must employ the mass media of communications as well as all the traditional channels of adult education."[1]

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[1] Fund for Adult Education, Annual Report, 1951 (White Plains, New York: The Fund, 195), n.p.

[2] Saettler, p. 239.

One of the first and most persistent appeals to the Ford Foundation came from the ETV lobby--educational institutions, private organizations and television stations seeking financial backing for ETV projects. The Ford Foundation considered, first, a separate fund to handle the problems of mass media, but the plan was scuttled and it was left to the two existing educational funds and to the Foundation itself to handle radio and television in any way that suited the purposes of each of them.

The National Association of Educational Broadcasters, led by George Probst, Director of the University of Chicago "NBC Round Table" and Seymour Siegel, Director of WNYC and the Municipal Broadcasting System in New York City, along with the director of WOI-TV and NAEB officers, held conversations with Fletcher.[2] Fletcher perceived educational television as an opportunity and a responsibility, a responsibility for the risk capital that philanthropy exists to provide. Though ETV would be broader than the area of the Fund's concern, it presented an urgent appeal for a philanthropic institution to give prompt attention to the ends and means implicit in the opportunity.

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[1] Fund for Adult Education. Ten Year Report, 1951-1961 (White Plains, New York: The Fund, 1962).

[2] ETV: The next 10 years, p. 342.

> C. S. Fletcher originally asked the Ford Foundation for $5 million so that the Fund might assist in the construction and maintenance of educational television stations and develop a national program and distribution center. When Fletcher outlined his plans to the Foundation trustees, they pointed out that Henry Ford preferred one elaborate model educational television station which would provide an outstanding example to others throughout the country. However, Fletcher, himself, convinced Ford that the Fund's plans were feasible and won his assent. The Fund then received $4.75 million (later supplemented by another $4 million) to develop its own policies for educational television.[1]

At its first Board meeting in April 1951 the Fund for Adult Education appropriated $90,000 to the JCET to support the work already begun. During the next four years the Fund awarded nearly $500,000 and immeasurable moral support to the JCET, while remaining outside the policy-making structure of the organization. "From the beginning the Fund was insistent that it should not hold a monopoly but that other foundations should be involved in the development of national educational television."[2]

Reservation of ETV channels

Finally, in April 1952, the FCC issued its Sixth Report and Order, which reserved 242 channels (later 267) for educational use. Of these 242 channels, 80 were within the VHF range, 162 within the UHF range. In reserving approximately 12% of the total allocations for education, the Commission stated:

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[1] Saettler, p. 240

[2] *Ibid.*

> We conclude that the record shows the desire and ability of education to make a substantial contribution to the use of television. There is much evidence in the record concerning the activities of educational organizations in AM and FM broadcasting. It is true and was to be expected that education has not utilized these media to the full extent that commercial broadcasters have, in terms of numbers of stations and number of hours of operation. However, it has also been showed that many of the educational institutions which are engaged in aural broadcasting are doing an outstanding job in the presentation of high quality programming, and have been getting excellent public response.
>
> And most important in this connection, it is agreed that the potential of television for education is much greater and more readily apparent than that of aural broadcasting, and that the interest of the educational community in the field is much greater than it was in aural broadcasting.... The public interest will clearly be served if these stations are used to contribute significantly to the educational process of the nation. The type of programs which have been broadcast by educational organizations, and those which the record indicates can and would be televised by educators, will provide a valuable complement to commercial programming.[1]

Commenting on the FCC reservations, Hull observed that

> The FCC had finally established a new nation-wide television allocations plan; created a new kind of broadcast entity, the "noncommercial educational television station", and reserved 242 channels for exclusive noncommercial educational use by schools, colleges, universities, and non-profit educational television corporations. The Commission had insured the development of special cultural and educational television service throughout the nation in an action as significant and far-reaching in its implications as the Morrill Act of 1862 which created the Land Grant College system in the United States.

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[1] ETV: The next 10 years, p. 333-34.

> These decisions by the Commission represented the culmination of an organized effort by citizens and educators, begun more than three decades before. The groups had now staked out a permanent educational claim in a new medium which they repeatedly called "the most important invention since printing."[1]

The original FCC ruling stated that the reservations might be challenged after June 3, 1963. It was imperative that education make a strong case before the reservations were challenged. Fletcher foresaw the need for a national agency to arouse, to coordinate and to advise local civic leadership; in November 1952 the National Citizens Committee on Educational Television was founded and awarded a $750,000 Fund for Adult Education grant. In May 1953 the Fund financed the first National Conference on Educational Television in Washington, D.C., sponsored by the Joint Committee on Educational Television and the National Citizens Committee on Educational Television. The important outcome of this conference was that soon afterwards the FCC announced that the reservation of channels for educational television would continue indefinitely.

Financing ETV development

As ETV station allocations were made a need arose for pump-priming grants to stimulate station construction and educational programming. During the summer of 1952 the

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[1] Ibid., p. 344.

American Council on Education, financed by the Fund for Adult Education, conducted a "Study of Community Readiness for Educational Television." On the basis of this survey, in the fall of 1952 the Fund offered grants-in-aid in amounts of $100,000 to $150,000 to university and metropolitan centers where channels had been reserved. A condition of each grant stipulated that the university or community cooperating double the grant either in cash or in facilities. The Fund's grants could be used for equipment only and carried provisions for the engineering quality of installations. An additional requirement was agreement both to contribute to and to draw from a common pool of recorded programs through a center facilitating such exchange of programs. Operating under a grant from the Fund for Adult Education, station KUHT-TV at the University of Houston went on the air as the first non-commercial broadcast station in May 1953.

The early development of ETV represents, to a large extent, the development of a "university of the air." Financed largely by the Fund for Adult Education, whose primary interest was "that part of the educational process which begins when formal schooling is finished" educational television was designed to reach people in their homes, via broadcast television. The focus of ETV was

> the educational television station and its purpose to provide an alternative national television program service characterized by its attention to news, information,

> public affairs, general education, and cultural enrichment. It was conceived within the framework of public as well as educational policy. It was directed to a free-choice audience of mature adults and out-of-school children.[1]

In its survey of the development of educational television, the National Association of Educational Broadcasters later concluded:

> The original development of educational television was sparked in large measure by the concern of adult education and by the recognized obligation of the land-grant colleges to foster and promote extension education. There is evidence that general adult and extension education continue to play a highly significant and stabilizing role in the continued development. Most of the educational stations ... schedule regular out-of-school and adult education programs. Indications are that this service is appreciating qualitatively and quantitatively.[2]

Problems of UHF broadcast

The fact that the FCC had reserved a preponderance of UHF channels rather than VHF channels was in conflict with this development. The problem as stated by Maloney and Donner, was that

> Most present television sets, which are capable of receiving only VHF signals, would have to employ converters in order to receive UHF and that manufacturers would have to agree, in the future, to produce receivers capable of both. This means that the shift to UHF cannot occur overnight as far as general broadcasting and

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[1] ETV: The next 10 years, p. 344.

[2] U.S. Department of Health, Education, and Welfare. Office of Education, The Needs of Education for Television Channel Allocations, report prepared by The National Association of Educational Broadcasters (Washington, D.C.: Government Printing Office, 1951), p. 18.

> reception are concerned. Widespread purchase of converters seems improbable, and the procedure of the FCC in dealing with set manufacturers would allow several years before the UHF-VHF receivers come on the market.[1]

The recommendations of the Television Advisory Panel of the U.S. Office of Education reflected this same hesitancy with regard to UHF:

> There is still a great deal of room available in the UHF (Ultra High Frequency) band, which offers more channels than VHF but smaller areas of coverage. Only a small percentage of the receiving sets now in use are equipped to receive UHF. Therefore, if a new station is added in the UHF band, in a community where the existing stations operate in VHF, the new station cannot be received until new television sets are purchased or UHF converters are installed.[2]

In its study of the needs of education for television channel allocations the National Association of Educational Broadcasters complained that

> There is little doubt that what amounted in effect to assigning channels to an apparently secondary service to meet apparently secondary needs--coupled with the confusion occasioned by the general intermixture of VHF and UHF channels in the assignment tables--inhibited development of the basic educational service.[3]

To document this contention, the NAEB cited the following situation:

> In the continental United States in October, 1961, there are 60 educational television stations on the air. Of these, 40 are Very High Frequency stations and 20 are Ultra High Frequency. Sixteen of the UHF stations are

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[1] ETV: The next 10 years, p. 203.

[2] Ibid., p. 8.

[3] Needs, p. 7.

> single outlets for educational television in communities in which the majority of the receiving facilities cannot receive them on their frequencies. As a result, their use for public service outside the school or college is highly restricted. Two of the UHF stations are second channels in communities already served primarily by VHF stations. These secondary supplemental channels are used mainly for direct in-school instruction.[1]

Development of Instructional Television

As educational television developed within the public sphere, educators looked to the medium of television as an answer to their in-school instructional needs. During the 1950's,

> The American educational system was bracketed between the population explosion and the "knowledge explosion and could no longer meet its responsibilities by conventional means. Moreover, very large sums were now available from private foundations and from government at various levels, to support new educational projects. And as always in the American culture, there was the feeling that television was now the newest wonder of science, and thus must surely solve the educator's problems.[2]

In his survey of informed opinion on television's future place in education, Dr. Lester Asheim concluded that:

> Above all, ETV came at just the right time, when it is no longer possible or desirable to maintain the status quo in many areas including education. The introduction of ETV coincides with a period of emergency in education, represented by the wave of enrollments and the consequent teacher shortage, by international tension which has focused attention on weakness in our educational system,

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[1] *Ibid*., p. 13.

[2] Koenig and Hill, p. 12.

> by a popular demand to increase educational productivity and by a widespread hospitality to innovation in almost all fields.[1]

Father John M. Culkin, S.J., an early leader in the development of ITV, summarized the attitude of the educational administrator toward the development of ITV:

> All in all it seems that this is a most propitious hour for the genie of television to have been let out of the bottle. Problems of quantity and quality in education have kept administrative fingers nervously close to the panic button for years. Rising enrollments and the need for additional teachers, buildings, and specialized equipment will be with us for a long time. The rapid growth of research and learning has every subject in the curriculum in a state of flux.... No one is naive enough to suggest that television will neatly dispose of all these problems, but one thing is certain. Problems of this proportion cannot be solved through conventional means. We will never be able to assemble teachers enough or bricks enough to multiply educational facilities to meet student demands. Television, however, can multiply a faculty without hiring a teacher. It can duplicate buildings without laying a brick.[2]

Broadcast ITV

ITV on commercial stations. Actual in-school instruction via commercial station telecasting was necessarily limited in scope. On a local basis, some school systems did broadcast instructional programing via local television stations. The Philadelphia public schools, for example, began as early as 1948 to use commercial channels. On a network level, NBC began in 1958 the series entitled "Continental Classroom," the first attempt to present a full course to a national audience. These televised courses were offered for credit by various institutions of higher learning. In 1960 Father Culkin wrote that "preliminary statistics indicate that an average daily audience of more than 270,000 viewers watched the program which was broadcast each weekday from 6:30 to 7:00 a.m."[1] Writing in 1961 Philip Lewis estimated that 560 school districts and 117 colleges and universities were using commercial television for regular instructional purposes.[2] The educational significance of commercial educational television broadcasts, according to Father Culkin, lay "beyond their power to teach science or their preternatural power to lure people out of bed at the first hint of dawn. Continental Classroom provides a national showcase for the educational potential of television."[3]

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[1] _ETV: The next 10 years_, p. 30.

[2] Culkin, "Television in the service of education," p. 25.

In his survey of informed opinion on educational television, however, Asheim found that "the majority of the respondents, while acknowledging the excellent educational programs that have appeared on commercial television, the helpfulness of the networks in providing study materials, and the cooperation that many local stations have extended to educational programming, were nevertheless convinced that educational television will have to be over and above the normal programming of the commercial stations, and on stations of its own."[1]

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[1] Ibid., p. 29.

[2] Lewis Philip. Educational television guidebook (New York: McGraw-Hill, 1961), p. 26.

[3] Culkin, "Television in the service of education," p. 30.

ITV on non-commercial broadcast stations. In addition to this limited commercial broadcasting, instructional television was also carried by the reserved ETV stations. According to Saettler, "much of the impetus to instructional television on educational stations can be traced to the pioneer instructional broadcasting experiments in the cities of St. Louis, Pittsburgh, and Chicago, and in the state of Alabama."[2] In the fall of 1955 the St. Louis public schools began providing televised instruction over educational station KETC. Courses were offered in ninth-grade grammar and English composition for thirty minutes, five days a week.

Alabama, in 1952, was the first state to develop an ETV network with three stations combining to broadcast approximately 65 hours each week. By 1960 the network taught more than 80% of the state's population and more than 250 schools utilized the networks televised lessons either for direct teaching or for enrichment.[1]

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[1] ETV: The next 10 years, p. 32.

[2] Saettler, p. 245.

Problems with open-circuit broadcasting of ITV

Although broadcast television did become an integral part of the teaching strategies of individual school systems during the 1950's, Asheim found in his 1960 survey of informed opinion that broadcast television was not, in fact, meeting the in-school needs of education. "Open circuit television", he concluded,

> is most promising for adult education uses, for larger school systems, and for reaching the rural residents, the home-bound, and the older person. Open circuit may be used to a limited extent in the classroom--especially for some occasional event of importance (the inauguration, a major speech of national significance, etc.)--but not nearly so widely as in informal adult education.[2]

The major and obvious limitation of open circuit television was the single channel allocation permitted by the FCC.

> The chief disadvantage of the broadcast station as the purveyor of school television is that it can use only one channel. Within the limits of a school day, an ETV station broadcasting a variety of subjects to the full range of school grades--even if only the elementary grades--is hard put to it to do a given series more than once or twice a week, particularly with the practical need for repeats.[3]

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[1] Culkin, "Television in the service of education," p. 34.

[2] ETV: The next 10 years, p. 31.

[3] Schramm and Chu, Learning from television, p. 21.

Again, in a 1962 survey of closed-circuit television operations, researchers concluded that:

> It should be obvious now to even the casual observer that a single educational channel will not suffice to handle adequately the many program needs of the typical community, ranging from in-school instruction, to in-service education of teachers, extensive adult programing of both a formal and informal nature, out-of-school programs for children and youth, as well as communications uses within a given school and between schools, and/or between the schools and other community agencies.[1]

A second, more subtle problem, emerged with the use by school systems of open-circuit broadcasting. Again, in Asheim's survey of informed opinion, the matter of local control and privacy is raised:

> There is danger that open-circuit telecasting of classroom content may put education up to popular referendum. Can courses in the social sciences, literature, biological sciences be as complete, as outspoken, as critical before a general audience as they should be in the closed classroom? The privacy, the lack of outside supervision, the primacy of educational objectives which characterizes the classroom make it possible to pursue knowledge of its own sake, to experiment with teaching methods, to make mistakes and benefit from them. This must not be lost.[2]

Maloney, at a later date, refers to this same problem:

> The twin facts that ETV works by broadcasting, and that therefore control over program content and style cannot be wholly in the hands of teachers and school administrators, has proved important. This situation has perhaps created some resistance by teachers and local administrators to the use of broadcast ETV.[3]

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[1] DAVI, CCTV survey, 1962, p. 70.

[2] ETV: The next 10 years, p. 34.

[3] Koenig and Hill, p. 198.

Closed-circuit ITV

Advantages of CCTV

> As broadcast ETV continued to grow, televised instruction also developed along another path, different both in technology and organization. By the early 1950's Michigan State and a few other universities were experimenting with formal course work over closed-circuit television. ....
>
> The advantages are fairly obvious: by using closed-circuit television, a school system or university can be in complete control of audience and programs.[1]

Closed-circuit television offered another tangible advantage for education:

> Because of its multi- rather than single, channel possibilities, it is ideally suited for instructional television use. The use of multiple channels opens up new scheduling possibilities as well as creates the potential of broader offerings from which teachers and learners can choose. It thus makes possible re-use of a given program several different times for classes of the same subject meeting at different periods.[2]

To answer the problem of "putting education up to popular referendum" CCTV offered yet another solution:

> Closed-circuit television is do-it-yourself television tailor-made to meet local needs. It is ideally suited to accomplish the programing and communications needs of a given school district or institution of higher learning obviating the necessity of strict dependence on cooperative programing with other school districts or complete reliance on programs produced at the state, regional, or national level. It requires the local school district to "do something" itself--to become active participants in educational television programing

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[1] Schramm and Chu, Learning from television, p. 22.

[2] DAVI, CCTV Survey, 1962, pp. 65-66.

> with a local flavor rather than simply passive recipients of programs rented, purchased, or borrowed from other sources. It puts a premium on local initiative in program development. This feature will appeal to many Board of Education who are concerned with maintaining control and autonomy of the curriculum at the local level.[1]

In short, "advocates of closed-circuit television argue that a closed-circuit television system not only can do almost all that broadcast television can do but that it can do it simultaneously on several channels."[2]

Financing CCTV development

Again, the philanthropy of the Ford Foundation financed, and thus to a large extent determined the direction of, the development of CCTV. In 1954 the Pennsylvania State University submitted a proposal to the Fund for the Advancement of Education, the in-school counterpart of the Fund for Adult Education; the proposal called for the University to undertake a program of demonstration and research in CCTV.

> The grant was awarded with the condition that no changes be made in teaching procedures; television "was simply being introduced into a normal classroom...." The lack of adaptation for the medium is fairly significant. Television, in this case, was being used purely as a means of transmitting a photographed class lecture.[3]

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[1] DAVI, CCTV Survey, 1962, p. 65.

[2] Ibid., p. 50.

[3] Koenig and Hill, p. 170.

In the Pennsylvania State experiment cameras were mounted in ordinary classrooms and connected by coaxial cable to other classrooms where matched groups of students viewed the lessons. Other courses were offered to classes by television only, and extensive experimentation was conducted with a talk-back system whereby the student could ask the instructor a question and get an immediate response. These experiments, conducted under the leadership of Professors C. R. Carpenter and L. P. Greenhill, "provided the stimulus for a national increase in the use of televised instruction."[1] The results indicated that the use of television did not reduce the quality of instruction or lower student accomplishment and that, once a CCTV system was installed, a decreased cost of instruction per student could be realized if the system was used effectively.[2]

The Hagerstown project in Washington County, Maryland, built with funds provided by the Fund for the Advancement of Education, a grant from the Electronic Industries Association and the Chesapeake and Potomac telephone company, represents one of the most elaborate CCTV facilities in the country. Beginning in 1956 the Hagerstown project proposed a comprehensive network to link every public school in Washington County. One feature of the Hagerstown project was that it was designed to meet a real need within the school system: the problem of a shortage of adequately trained teachers. The CCTV programing was specifically planned to provide instruction not possible with existing staff--art, music, foreign language, remedial reading. In addition, the project called for an extensive teacher in-service educational program.

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[1] Ibid., pp. 170-71.

[2] Saettler, p. 247.

The Chelsea Closed-Circuit Television Project, again funded by the Fund for the Advancement of Education, began in 1957 a project to use CCTV for "direct teaching, school enrichment, teacher training, language instruction, and improvement of community integration within a specific ghetto in New York City."[1] In the Chelsea Project schools, homes, health and social services in a Spanish-American community were connected by CCTV:

> A number of new specialized functions for which CCTV was useful emerged out of the Chelsea Television Project. Closed circuit proved useful (1) as a distinct in-school system within a large city, where special problems of home environment tend to be recognized in their distinct distribution; (2) as a city-wide school system specifically used for teacher-training, examinations, and administration; (3) as an unlicensed ETV station where local conditions require a community antenna and there is no ETV reservation; (4) for education directed to institutions other than schools and colleges.... (5) as a means of meeting the challenge of the small urban area containing a high concentration of people with hard core educational or cultural problems; (6) as

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[1] Koenig and Hill, p. 172.

> an instrument for the development of community leadership; (7) as a form of psychotherapy.[1]

The foregoing summary of the Chelsea Project points out an important development in the growth and direction of CCTV, i.e. education was finding new uses for CCTV systems. While CCTV systems were installed for direct instructional purposes, educators found new applications for their CCTV systems in meeting their educational needs.

> These avenues range from relatively unsophisticated use of a single camera and receiver to a highly sophisticated statewide network rivaling open-circuit television.... The uses of closed-circuit television have taken form either as a system of communication or as an audiovisual tool. In the former, its greatest use has been ... the distribution of direct teaching. As an audio-visual tool, closed circuit television has been used by the teacher to magnify those aspects of his lesson that are enhanced by this technique.[2]

Growth patterns

In general, the growth of CCTV was not as rapid as the growth of broadcast television. Since the CCTV installations are not subject to FCC licensing, it is difficult to arrive at precise figures, but several surveys of CCTV were conducted during the late 1950's. Based on surveys conducted by the JCET, statistics indicate that 64 institutions were using CCTV systems in 1956.[3] By 1958, when the JCET publish a Directory of CCTV Installations, the figure had risen to 119. Following the JCET report of 1958, "the number of CCTV installations became a victim of 'educative guestimating.'" Estimates ranging from 200 to 500 were quoted in varied texts and periodicals.[1] The JCET figure, updated in 1960 on the basis of newspaper and periodical listings, as well as correspondence with the Committee, rose to 185.[2]

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[1] Ibid., p. 173.

[2] DAVI, CCTV Survey, 1962, pp. 50-51.

[3] ETV: The next 10 years, p. 169.

These figures, while not entirely accurate, do indicate one definite pattern. The year 1958 begins a sharp increase in the number of CCTV installations. According to the 1962 survey of CCTV development:

> It seems logical that this increase in CCTV paralleled the increase of most audio-visual equipment due to the stimulus of the National Defense Education Act. The year 1958 also represents a period in which experimentation with television left no doubt that educators could teach by the use of television. By 1958, improvements had been made in the vidicon and other closed-circuit television apparatus.[3]

Videotape recording

One technological improvement was of particular significance to local instructional television: the introduction of the videotape recorder. Nelson describes the problem that faced operators of local ITV facilities:

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[1] DAVI, CCTV Survey, 1962, p. 2.

[2] ETV: The next 10 years, p. 180.

[3] DAVI, CCTV Survey, 1962, pp. 22-23.

> There is cause for concern that closed-circuit television, strictly local in nature, will work to the detriment of the very thing it seeks to enhance--quality standards of instruction. In the hands of overzealous promotors, in the face of attempts to look upon it as a panacea for all of education's problems, and in the selection of inexpensive equipment and poorly qualified personnel who have rushed in from other fields, there is real danger that closed-circuit instruction of a purely local nature will be weighed and found wanting.[1]

Again, J. Bernard Everett reported at a May 1959 seminar sponsored by the Division of Audio-Visual Instruction,

> At present each in-school television operation is trying feverishly to produce with a limited budget all of the courses which it needs. This makes no more sense than it would for each school to try to produce all of the textbooks and films it needs. It will always be necessary and desirable to produce some courses of purely local interest. But in many instances, it matters little whether a course is produced in Boston or San Francisco if it is of superior quality.[2]

In his history of the development of CCTV Gumpert summarizes the importance of the introduction of the videotape recorder:

> Before 1956 one of the problems which surrounded the efficient utilization of closed-circuit television was the lack of an adequate and economical recording capability. Some larger installations did have kinescope recorders at their disposal, but obtaining final prints was slow and results were inferior to film. The lack of an adequate recording capability affected every potential user of television. In 1953 Bing Crosby Enterprises displayed a prototype of a videotape recorder, a non-

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[1] ETV: The next 10 years, p. 181.

[2] Division of Audio-Visual Instruction Service, National Education Association, Opportunities for Learning; Guidelines for Television. Report of a seminar held at NEA headquarters, May 16-18, 1959 (Washington, D.C.; National Education Association, 1960), p. 40.

> filmic device which used tape similar to audio tape; but the model was not yet perfected for production and distribution. The Ampex Corporation demonstrated the first production model of a videotape recorder at the Chicago convention of the National Association of Broadcasters in 1956. In November, the Columbia Broadcasting System in Hollywood began using the videotape recorder for network delayed broadcasts because of the time differential between the East and West coasts. The first ETV station to use videotape was WGBH, Boston, in June 1958. In 1959 the University of Texas became the first university to utilize video recording for closed-circuit instruction.
>
> The advent of tape must be considered an important breakthrough for televised instruction. Here was a means for recording and immediate playback with the impact of a live transmission. In addition, videotape was erasable and reusable. With the ability to pre-record lessons, quality control became possible. A lesson could be evaluated, analyzed, tested, and produced again, if needed, before being used in the classroom. Videotape allowed for the repeatable playback of lessons.... Lessons could be produced once, but used for several years, thereby reducing some instructional costs. The use of videotape also allowed for the exchange of lessons between institutions possessing videotape facilities.[1]

The Ford Foundation, through the Fund for the Advancement of Education, eventually equipped every educational television station with hardware for videotape reproduction. This widespread introduction of videotape equipment made possible not only the sharing of local programming, but the re-broadcast of programs to meet individual classroom needs.

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[1] Koenig and Hill, pp. 174-75.

Faith in Television as an Instructional Tool

In her history of the development of ITV Taylor writes that "by the end of the 1950's, ITV trends were clearly established and there was no longer an question of whether to use TV, but rather *how* to use TV in education."[1] There is considerable evidence to support her statement.

In a 1958 appraisal of television in instruction, the Department of Audio-Visual Instruction of the National Education Association expressed this faith in television as a teaching medium:

> Used in the classroom, television can be a powerful means of communicating knowledge and attitudes, helping to provide pupils with an improved environment for learning. Exposure to television does not in itself constitute education. But televised experiences, properly applied in the total teaching-learning process, can make substantial educational contributions.[2]

Robert Hilliard, then of Adelphi College, and later Chief of the Educational Broadcasting Branch of the FCC, observed that:

> Those who feared that television would become an insurmountable mechanical barrier between the teacher and student ... are generally changing their minds, much like those who had the same doubts about the potential destruction of education by ... the printed book.[3]

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[1] Koenig and Hill, p. 143.

[2] Department of Audiovisual Instruction, National Education Association, *Television in instruction; An appraisal* (Washington, D.C., National Education Association, 1958),

[3] Robert L. Hilliard, "The College aids the high school through television," *High School Journal*, XLI, No. 5 (May 1958), 206.

Hull summarized his findings as follows:

> Educational television's potential benefits to U.S. citizens are almost immeasurable. They could now be viewed in terms of alternative program choice, opportunities for formal and informal adult education, out-of-school children's programming, as a method of meeting the new quality and quantity needs of schools and colleges in terms of formal instruction....
>
> The problem no longer is whether to use ETV as a teaching instrument. The new questions are rather "where" and "when," "for whom" and "how often" and "in what context."[1]

The amount of research that was conducted to determine the effectiveness of television as a teaching tool is staggering. Much of the research was conducted as a requirement to receive Ford Foundation funds, either through the Fund for Adult Education or the Fund for the Advancement of Education. In 1960 Wilbur Schramm undertook the formidable task of comparing over 400 research studies of the effectiveness of television in instruction. His conclusive findings may be summarized in the following quotes from Schramm's report:

> There can no longer be any doubt that students learn efficiently from instructional television. The fact has been demonstrated now in hundreds of schools, by thousands of students, in every part of the United States and in several other countries. The list of subjects which schools and colleges have been able to teach effectively by television includes: arithmetic, algebra, geometry, calculus, accounting, consumer mathematics, physics, chemistry, biology, physiology, general science, engineering, psychology, sociology, anthropology,

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[1] ETV: The next 10 years, p. 345.

> government, history, economics, electronics, humanities, art, music, philosophy, literature, spelling, physical education, reading, writing, social studies, health and safety, driver education, Spanish, French, German, Russian, English, typewriting, and slide rule. Over all this list, the conclusion of testers, school administrators, teachers and students alike has been that the average student is likely to learn about as much from a television class as from ordinary classroom methods. In some cases he will learn more, and in some less, but over-all the conclusion has been "no significant difference."[1]
>
> Instructional television is at least as effective as ordinary classroom instruction, when the results are measured by the usual final examinations or by standardized tests made by testing bureaus.... Employing the usual tests that schools use to measure the progress of their students, we can say with considerable confidence that in 65 percent of a very large number of comparisons, between televised and classroom teaching, there is no significant difference. In 21 percent, students learned significantly more, in 15 percent, they learned significantly less from television.[2]
>
> It [ITV] is very good at bringingdemonstration to the classroom.... It lets a school or a college share its best teachers, rather than rationing them. It provides a change of pace, often a lift, for the classroom. It brings a sense of timeliness to classes where that helps. It concentrates attention.[3]

Office of Education Studies

In the light of this faith in educational television and the problems which hindered the further development of the medium, the Educational Media Branch of the U.S. Office of Education, under the direction of Dr. C. Walter Stone sought to answer some of the problems confronting educational television. In late 1960, the Office of Education commissioned four comprehensive studies of educational television. In Educational Television: The Next Ten Years, a volume which includes reports on these studies, Wilbur Schramm outlined the Office of Education project:

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[1] ETV: The next 10 years, p. 52.

[2] Ibid., p. 53.

[3] Ibid., p. 67.

> One of these [studies] was designed to survey the plans of educational institutions, systems and communities for the use of educational television, to estimate the channel allocations these plans would require if carried out, and to make engineering studies as to how these needs might be met. This study was contracted to the National Association of Educational Broadcasters....
>
> The Office contracted a second study to personnel at the University of Nebraska. This was to survey the needs and plans of educational systems and institutions for exchange of teaching materials on television, and to make recommendations as to how the indicated needs could be met....
>
> A third study was assigned to the Institute for Communications Research, at Stanford. The task was to look at the future of educational television in a more general way than either of the other studies. It was to consider the problems of financing, educational television, of raising program quality, of training adequate manpower, of the future instructional uses of television, of designing and equipping schools for television.
>
> The fourth contract was placed with the National Educational Television and Radio Center, and provided for a study of the audiences of eight educational television stations in six different situations throughout the country....
>
> Finally the Office asked its Educational Media Study Panel to hear testimony on the problems and potential of television from a number of distinguished and informed citizens, and on the basis of that testimony and the

three studies to make some recommendations concerning "the next ten years" of educational television.[1]

The reports of these studies had a definite impact upon the development of educational television in general and upon the beginnings of Instructional Television Fixed Service in particular. On the one hand, the NAEB study on needs of education for channel allocations documented the needs of education, particularly in-school formal education, for television channels. On the other hand, Town, Maloney and Donner, Greenhill and Carpenter, working on the Stanford study, offered creative technical solutions to problems of spectrum saturation. The type of solutions proposed in their studies embraced some of the basic technical aspects of 2500 MHz television as finally conceptualized by the FCC. The inclusion of these findings in the formal recommendations of the Educational Media Study Panel brought both the needs and the proposed solutions to the attention of educational leaders and of the related government agencies, the Office of Education and the FCC.

NAEB study

William G. Harley, President of the National Association of Educational Broadcasters, submitted in November 1960 a statement to the U.S. Office of Education in which he outlined the problems of determining the needs of education for use of space in the television spectrum. In his summary statement Marley outlined the problems of ETV and ITV:

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[1] ETV: The next 10 years, Preface, pp. viii-ix.

> At present education has a total of 267 reservations, of which about one-third are VHF and two-thirds are UHF--for the reception of which there are few receivers. In many major cities, education was assigned only VHF frequencies. The failure of UHF to develop commercially has made it virtually impossible to establish educational television stations on UHF channels in these VHF areas. If more VHF channels are made available, it will be important for education's needs to be presented whenever there is an opportunity for a VHF assignment.
>
> Moreover, there appear to be growing needs for more reservations in the UHF band to serve the needs for multiple channel assignments in metropolitan areas and to fill out the coverage pattern for developing statewide and regional educational television networks.
>
> Many channels will be required to serve future television instructional needs and thorough planning should be done by educators in order to insure that these requirements are met. The Federal Communications Commission is under constant pressure for channel space in a spectrum already crowded and pressure can be expected to increase. Plans for activation of existing reserved channels and requests for additional channel space should include documentation that is as specific and definite as possible.
>
> Determination of spectrum space assignments will have to be made by the Federal Communications Commission on the basis of total needs. In such considerations, it is imperative that the total needs of education for specialized instructional services, networking, and general cultural programming--present and future--be articulated. It cannot be expected that the Federal Communications Commission should think these problems through and provide its own blue print for an adequate educational television service for the nation. It is the educators, together with the pioneers in the educational television movement, who need to study the educational television requirements of the future. When needs are known, the proper technical planning can be done and

> the commission can have at its disposal evidence in a form most useful for assisting in its spectrum space determinations.[1]

In order to document these convictions the NAEB proposed an exhaustive survey of the use and development of television as a basis for projecting the needs of education for television channel allocations. The survey, supported by Title VII, Part B of the National Defense Education Act, was authorized January 1, 1961. Specific objectives of the NAEB study were the following:

> 1. To determine within a reasonable approximation the needs of education, on all levels, for television spectrum space during the next 10 to 15 years, as a basis for determining an adequate system of educational television channel allocations.
>
> 2. To appraise the practical potential coverage of the present educationally reserved channels. From this base determine a table of assignments that will provide a comprehensive primary service to education, established to furnish a basic single national educational coverage compatible with the greatest receiving potential of each community.
>
> 3. To determine, from the preliminary data, the variable needs of the different localities for multiple channel use for educational purposes during the next 10 to 15 years; and to support these findings with the determination of a system of allocations which can meet such needs as they occur.[2]

The consulting engineer firm of Jansky and Bailey was engaged to work with the staff of the NAEB to study the adequacy of reserved channels for handling established educational needs, to determine channels available under existing rules that could be added to the reserved list for a primary nationwide service, and to specify additional channel allocations necessary to answer the established needs of education.

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[1] Quoted in Needs, p. 8.

[2] *Ibid.*, p. 11.

The NAEB staunchly reiterated in its report that "the primary educational television channel in a community be available ... in the Very High Frequency band."[1] Their reasons for this insistence were the facts that "most of the large population centers are geared for VHF reception," and that VHF "offers greater service coverage at less cost to television centers embracing several small towns and a large rural one."[2] This concern with the general public reflected the long-time association of ETV broadcast stations with adult education. The survey did acknowledge that

> The remaining deficit must be met with Ultra High Frequency channels, though the use of UHF for primary service is limited to those communities which are equipped for it. It is obviously futile to broadcast on frequencies which cannot be received by the community.[3]

In order to determine the projected needs for educational television of the total community, the NAEB surveyed

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[1] Ibid., p. 3.

[2] Ibid., p. 3.

[3] Ibid., p. 3.

five major segments of the educational community: (1) Colleges and universities; (2) Local public school systems; (3) State departments of education; (4) Local civic and political leaders; (5) Active educational television stations. "Extended reports from three or more of these sources were received from all of the states."[1] The NAEB summarized its findings as follows:

> The compilation of the data showed a minimum need for 97 VHF and 825 UHF channels to be added to the presenting reserved 88 VHF and 187 UHF television channels. This makes a total of 922 channels added to the present 275 educational channels for a grand total of 1,197 channels needed for education.... A careful search of the table of allocations in reference to the indicated areas and scope of channel needs produced a table of "additional availability" of 48 VHF and 608 UHF channels, or a total of 656 additional channels that would fit the pattern of need.[2]

To a large extent, the number of ETV stations calculated by the NAEB survey team reflected the insistence of educators upon multi-channel capability for in-school television.

> Most of the schools held that two or more channels were necessary to provide for complex schedules, the number of courses, and the various areas of service....
>
> The number of channels needed by any school system, or complex of systems, depended not only on the size of the community but also ... on the scope of use planned. Method of instruction seemed to have some additional bearing upon multiple channel use. Where deficiencies

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[1] Needs, p. 2.

[2] Ibid., p. 5.

> are greater, and instruction by television is planned as total course presentation, or as regular systematic instruction on any basis, the need for channels is greater. All these factors were included in the final project of total minimum needs for each state.[1]

Again, the study concluded that:

> For a number of reasons, the schools indicated a greater demand for multiple channels than did the colleges. Differences between elementary and secondary instruction, and the added pressure of special education departments and junior colleges, combined to increase the need for flexible schedules and numbers of courses requiring simultaneous broadcasting.[2]

The educators' demands to multi-channel capability, as echoed in the documentation supplied by the NAEB survey, necessitated some new approach to solution of the problem of channel allocation. In the formal recommendations of the Television Advisory Panel of the U.S. Office of Education, based on the Office of Education sponsored studies, including the NAEB survey, the problem was stated unequivocally:

> It is clear that the nature and magnitude of anticipated future needs should be made immediately known at the Federal Communications Commission; and that these recommendations should concern the full use and reservation of education's fair share of all spectrum resources.[3]
>
> The future development of "open-circuit" educational television is limited by the channels available to carry its signals. It is imperative, therefore, that every

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[1] Ibid., p. 4.

[2] Ibid., p. 4.

[3] ETV: The next 10 years, p. 8.

> effort be made to reserve the necessary spectrum resources required by the anticipated growth and development of educational television.[1]

Alternatives

The Office of Education studies offered more than documentation of the problems, however; other research projects looked to facilities and resources to solve the problems of educational and instructional television in the next ten years. In his study of "Allocations for Educational Television" George R. Town, Dean of the College of Engineering at Iowa State University, considered the alternatives at the disposal of the FCC and education:

1. One possibility was to allocate more VHF channels. While acknowledging "very substantial advantages" in the use of VHF television, Town pointed to the problems of competition for limited VHF spectrum space. Commercial television had always expressed a need for more channels, especially for VHF channels, he maintained, and "for an equal length of time the FCC had been unable to grant these desires." Town flatly concluded that "the prospects of obtaining additional VHF channels for television seem dim indeed."[2]

2. Another option was to provide more stations on existing VHF channels. Techniques were available, Town

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[1] Ibid., p. 10.

[2] Ibid., p. 241.

noted, to permit a reduction of station spacings in some instances without a significant increase in interference. These techniques should not, however, be applied indiscriminately but only after a case-by-case study of the problems which were involved. Neither should it be concluded that the application of these techniques would greatly increase the number of stations which can be accommodated in the existing twelve VHF channels.

3. All-UHF operation offered another alternative. The first objection to moving entirely to UHF was that VHF "is well established":

> The viewing public in this country has purchased some 77,500,000 television receivers.... Most of these are equipped to receive VHF channels only. Television viewing has become a major avocation of a high percentage of Americans.... Does it seem probable that any group elected by the public or any regulating agency dependent upon such elected group for its support would tell the public that after such-and-such a date ... all their present television receivers would be useless, that the new receivers which they purchased would cost more and that, in most instances, poorer television service would be obtained?[1]

Further, Town concluded that

> More stations are required at UHF than at VHF to cover the same area or to produce the same service; that the spacing between UHF stations cannot be reduced in the same proportion as the service range and that therefore more channels are required to serve a given area; and that because of local oscillator radiation and image problems which are present at UHF ... the number of channels available for assignment in any given area is reduced.... Perhaps there are effectively not more than

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[1] ETV: The next 10 years, p. 244.

> twice as many or, as an extreme upper limit, three times as many UHF channels as VHF channels. In view of the ever increasing demand for television channels by both commercial and educational interest, it is therefore not technically sound to abandon the VHF region. But the VHF and the UHF regions should be retained.[1]

4. Another alternative was to continue the status quo: continued random-mixed VHF and UHF operation. Looking at the history of this system, however, Town concluded that

> Experience in commercial television broadcast over the past nine years has shown that while in an all-UHF area, commercial UHF television is a success, in the intermixed area, the UHF station ... operates at a great disadvantage, in fact, in an area with two VHF stations and one UHF station, the UHF station is almost certain not to survive.[2]

5. As a final option, Town proposed allocation of channels for educational broadcasting. In determining the needs of education for television, he observed, "it is necessary to look toward the future and not be restricted to thinking in terms of the number of educational television stations which have been established since 1952."[3] Looking to the future, Town anticipated increased educational services and increased school populations. "It certainly does not seem unreasonable," he surmised,

> that as some cities already see the need for two educational television stations, many areas will eventually

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[1] Ibid., p. 245.

[2] Ibid., p. 246.

[3] ETV: The next 10 years, p. 246.

> need at least the equivalent of three VHF stations. Already some cities visualized the need of six UHF channels and in some of the largest cities, studies indicate that educational television may well need 12 or more UHF channels. On the basis of this assumption, it is not unreasonable to expect that within the next decade or so, educational television will become as large a service as is commercial television today.[1]

In view of the extensive needs of education and the fact that "it is not at all reasonable to expect commercial television broadcasting to vacate their present VHF space ... what choice is there which will permit educational television to expand except that of using the UHF region?"[2] In fact, Town argued, the prospect of using UHF for educational television had several merits:

1. In areas where the signal strength is adequate UHF television produces the best pictures. High quality pictures are needed in educational television if it is to serve the needs of the schools.

2. While UHF television stations do not have the range of VHF stations, they can have a greater effective range as educational television stations than as commercial stations.

3. While it would not be economically feasible to build really good television receivers for the general public, schools could erect a high grade receiving system to

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[1] *Ibid.*, pp. 246-47.

[2] *Ibid.*, p. 247.

pick up television signals for internal distribution throughout a school building.

4. High quality preamplifiers with low noise factors might be employed, installed at the receiving antennas rather than in the television receivers.

5. The use of high quality receiving equipment, especially antennas and preamplifiers, would extend the effective range of UHF stations. While such equipment would be too expensive to sell to the general public in a highly competitive market, it would not be unduly expensive as part of the television receiving equipment for a school.

6. The use of low-power on-channel boosters with highly directional antennas to extend service not throughout all of a given area but rather toward specific educational centers could also extend the effective range of UHF.[1]

Almost parenthetically, Town notes that

> So far no mention has been made of the possibility of new thinking that would lead to radically different types of television and to new transmission standards.... No consideration has been given to the possible use of higher frequencies, in the microwave region or super high frequency region (3,000 to 30,000 Mc) for educational television. Such frequencies are of great value for point-to-point communication, but they do not appear to be suitable for broadcasting. If microwave frequencies were used for educational television, they might be adequate for some type of in-school service.[2]

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[1] ETV: The next 10 years, p. 248.

[2] Ibid., p. 249.

After a related discussion of technical alternatives, Maloney and Donner, writing in the same volume, made a similar suggestion:

> Low-power UHF broadcasts directed to specific audiences for viewing within a limited area ... is another matter... This kind of installation would be, in effect, closed circuit, since the signal would be receivable only within short range, and then only on UHF receivers.[1]

Federal Communications Commission

Staff members at the Federal Communications Commission, including Dr. Lawrence T. Frymire, then Chief of the Educational Broadcasting Branch, had long shared the concern of educators "that both the channel numbers available for education in the long range future, as well as the way in which they would most likely be used, was not going to satisfy the educators' needs over the years."[2] The Commission, however, faced a dichotomy, expressed by McIvor Parker, then Supervisory Engineer in the Rules and Standards Division:

> The broadcast band is a unique service, not really designed for private use. It is one in which there are a great many receivers in the hands of the general public which are capable of tuning only to this band. While a private service can buy its own transmitters and receivers and put a channel anywhere in the spectrum, a broadcast station, to survive, must go on a channel for which the receivers are already in the hands of the public.[3]

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[1] Ibid., p. 203.

[2] Frymire, personal interview.

[3] Parker, personal interview.

The use of limited broadcast bands for a private service--including education--represented to the Commission a misuse of the spectrum.

The Commission, therefore, sought the types of solutions to the problems of education that had been raised by Town, Maloney, Donner and others. While staff members could determine methods of more effective spectrum utilization, however, they faced at the same time a problem of availability of hardware for formerly unused areas of the spectrum.

Chapter II

Design and Authorization of ITFS

Translator equipment

As educators pressed their demands for expanded channel allocations, new engineering techniques were being employed to extend the coverage of existing television channels, both commercial and educational. A persistent problem in signal distribution was "shadowing" caused by unusual terrain or by scattered clusters of population beyond the transmitter.[1] In order to extend the range of a television transmitter to such shadowed areas "an economical means of 'filling in' or extending the coverage area of a high-power VHF or UHF station is desirable."[2] One solution to this problem, developed in the mid-1950's, was a low-power satellite station known as a translator. These translators, according to Kessler's definition,

> are unique in that they merely "translate" the frequency of the parent transmitter to another channel to permit rebroadcasting the program on a very low power of either 1, 10 or 100 watts. In this way, the low-power translator provides a much stronger signal to the receivers

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[1] ETV: The next 10 years, p. 321.

[2] Kessler, Fundamentals, p. 23.

> in the weak-signal area with minimum picture degradation due to the close proximity of the translator to the TV receivers served.[1]

Adler Electronics, a small manufacturing firm in New Rochelle, New York, was among the major producers of translator equipment. The Adler equipment was described in promotional literature as

> an automatic transmitter which enables isolated and fringe communities to enjoy TV picture reception equal in quality to that seen by viewers near main stations. Each Translator receives signals from one originating station and converts them ... to a UHF (Ultra High Frequency) channel for rebroadcasting. Since each Translator can transmit only one channel, a separate unit is required for each channel.... This transmitter is a basic part of the complete Translator station.[2]

The total Adler Translator Station consisted of a VHF receiving antenna, a 10 watt translator-transmitter, a 100 watt translator amplifier, UHF Unitized Transmitting Antennas, Interconnecting cables and accessories.[3]

The unique feature of the Adler system was that, instead of frequency modulation, which is normally used in microwave service, this system used a conventional television signal in the 1990-2110 MHz range. This portion of the UHF band, reserved by the FCC for translator service, was described by Adler as "remarkably free of interference."[1]

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[1] Ibid., p. 23.

[2] Adler promotional brochure, "Adler Television Translator Systems," n.d., p. 3.

[3] Ibid., p. 3.

> The technical characteristics are substantially the same as those of a regular television broadcast station. The visual carrier is amplitude modulated and the aural carrier is FM. The visual carrier is located at 1.25 mc above the lower edge of the channel and the aural carrier is 4.5 mc above the visual.
>
> There are two departures from VHF TV broadcast transmitter practice: 1) the signal is modulated at a much lower frequency than the output and at a low level and heterodyned to the final frequency and raised to the ten watt power level. 2) The visual and aural carriers are combined early in the transmitter and carried together through the intermediate steps of the final stage. The transmitter is thus simpler and the requirement for a diplexer to combine the outputs from separate visual and aural transmitters is eliminated.[2]

Translator television could be received on an all-channel television set or on a standard home set with a UHF converter. For distribution within a building, "a UHF receiving antenna and a single UHF-to-VHF converter can be used to feed any distribution system."[3]

The technical advantages of the translator system was described by Edward Galuska, an engineer with the Adler Electronics firm:

> In such a system, the TV signal as it goes along the relay chain is not subjected to demodulation and remodulation at each transmitter point, but merely undergoes frequency conversion.... The sound and picture information is not extracted or separated from the carriers.

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[1] Ibid., p. 3.

[2] Byron St. Clair, "2500 Mcs. Instructional Television," TV and Communications, EMCEE reprint, n.p.

[3] "Adler television translator systems," p. 3.

> Only the frequency of the carriers is changed. Since most sound and picture degradation occurs during the separation process ... deterioration of these signals is held to an absolute minimum. Pictures and sound of the highest fidelity is the end result. This, plus the fact that the aural and visual signals are carried through common units, permits the use of simple, economical, easily maintained equipments.[1]

By the early 1960's there were over 300 translator systems operating throughout the United States and in foreign countries.[2] The service had developed to a point where local groups became interested in putting in their own programming; local production, however, was prohibited at the time by the FCC which ruled that the translator service, classified as "non-profit" could only rebroadcast material that was on the air. Ben Adler, president of the firm, along with other manufactures of translator equipment, was actively engaged in trying to convince the FCC to authorize local programming, with its incumbent commercials and financial support. Adler optimistically advertised to ETV interests that "with the addition of an Adler aural-visual drive which accepts the video and audio signals from a studio, a translator can broadcast local ETV programs when authorized to do so by the FCC."[1]

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[1] Edward Galuska, "A Florida Educational Television Rebroadcast Network," Paper prepared for Adler Electronics, Inc., New Rochelle, New York (February 15, 1960), p. 2.

[2] Ibid., p. 2.

[3] Edward Galuska, private interview held in Chester, Connecticut, August 1, 1969.

At the convention of the National Association of Broadcasters in 1961 Adler demonstrated his translator equipment. Staff representatives of the Commission, including McIvor Parker, saw the exhibit and questioned the Adler representatives about the capabilities of the system.[2] It was Parker who first envisioned Adler's translators as a viable solution to the problem of channel allocations for education.[3] Most of the educational users, he surmised, especially the public schools, operated over a limited range. All would have control over both the transmitting and receiving equipment. A school system or university, moreover, could afford the type of reception equipment that would make the 2000 MHz frequency range impractical for the general public. As Town had pointed out earlier:

> It is not economically feasible to build really good television receivers for the general public. The schools, however, can erect a really high grade receiving antenna system to pick up television signals for distribution throughout the school.... Such equipment is too expensive to sell to the general public in a highly

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[1] Adler promotional brochure, "Educational television for your community," p. 4.

[2] Galuska, private interview.

[3] Lawrence T. Frymire, private interview held in Chicago, Illinois, August 17, 1969.

competitive market, but it is not unduly expensive as part of the television receiving equipment for a school.[1]

Translator systems for education

The translator system offered a type of "on air closed-circuit" television that could answer the demands expressed by in-school users of instructional television for multi-channel capability, local control and economy. First, because the licensee would have control of both transmitting and receiving equipment, he would be able to design a total system taking full advantage of careful engineering. "Through the use of directional receiving antennas transmitter power limited to coverage requirements and proper systems engineering, many systems can be installed in a specific area."[2] The possibility of re-allocating channels in adjoining areas would eliminate the problem of spectrum saturation and allow the assignment of several channels to a single licensee.

Second, "the necessity for a special antenna and multi-channel converter at each receiving location provides a degree of transmission privacy."[3] Such privacy would facilitate local control over program content and, further, over scheduling to meet local needs. "Since each locality, student body, curriculum and time schedule is unique and different, local control of instructional television is as important as local control of the many other facets of the instructional program."[1]

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[1] ETV: The next 10 years, p. 248.

[2] Betty McKenzie, ed., Instructional broadcasting, Proceedings of The National Association of Educational Broadcasters Conference, May 13-15, 1963.

[3] Kessler, Technical Requirements, p. 2.

Third, the translator system would offer economy in terms of spreading costs of instructional television and in terms of equipment costs. Speaking of the necessity of spreading the costs of television instruction, Lapin observed:

> Many costs of instructional television are present which are independent of the number of students receiving the lesson material. These include, among other, preparation and presentation of the program material; operation of the TV studio; time of the TV teacher; and material to assist the classroom teacher in coordinating her lessons with the television instruction. These costs are high, if a quality teaching job is to be performed. Usually, the only way that this high cost can be justified is to have the material available for a large number of students....
>
> A method must be utilized to distribute the television signals to other, separated buildings housing the remainder of the student population. A distribution method is almost always preferable to duplicate originating facilities in each school building, since each duplicate facilities would result in costs which probably would be out of proportion to the benefits received.[2]

Moreover, equipment necessary for the translator system would offer further savings to school systems and institutions.

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[1] Lapin in Proceedings, p. 67.

[2] Ibid., p. 67.

Directing antennas and receivers could concentrate the power of a very low power transmitter, eliminating the necessity of cost high power equipment and elevated antennas. A high gain receiving antenna, directed towards the transmitter, could collect much more energy than the conventional television. As a result of this combination a low cost 10 watt transmitter could provide the equivalent of several kilowatts.[1] Since standard television signals would be received at each school, only a frequency converter and antenna would be required for the building. A single converter and antenna would feed into a wired internal distribution system which would carry the signal to individual classrooms for reception on standard television sets. School systems would therefore be able to make use of two types of equipment many schools already owned--closed circuit internal distribution systems and standard television receivers.[2]

Within a month of the demonstration and discussion at the NAB convention, the FCC contacted Adler to see if he would be interested in conducting an educational experiment with his translator equipment.[3] For a demonstration location, the Commission looked to New York State where the

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[1] McIvor Parker, private interview held in Washington, D.C. January 2, 1970.

[2] Ibid.

[3] Ibid.

State Education Department had been actively involved in funding programs in instructional television for several years. Cortland, New York, had a closed-circuit system linked by very costly telephone company cables. Stanley Lapin, representing the Adler firm, visited the State Department, explained the translator equipment, and attempted to arrange a demonstration at Cortland. When a political complication involving a state contract with the telephone company arose, no experiment was scheduled.[1]

Plainedge Demonstration

The Union Free School District #18 at Plainedge, Long Island, was ready, however. Plainedge had been interested in television from its inception so, when the Plainedge High School was built in 1958, the studio was built into the school.[2] In 1962 the system was operating with its own industrial cameras, each with its own generator. The video signal was carried from studio to classroom via cable, while the audio portion was picked up and distributed through the school's public address system. Reception was predictably unsatisfactory. Dalton Levy, Director of Audiovisual Services, expressed his concern:

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[1] Raymond W. Graf, private interview held in Albany, New York August 27, 1969.

[2] Dalton Levy, personal interview held in North Massapequa, Long Island, New York July 31, 1969.

> During the initial stages of production, we realized that a televised picture somewhat similar to that produced on commercial stations would be required. Students were accustomed to professional programming. Local productions below these qualifications decreased students' learning and retention capabilities.[1]

In understandable search for an improved television facility, Plainedge applied for a grant from the New York State Department of Education.[2]

Subsequently, the Plainedge system came to the attention of the Adler officials, still looking for a place to demonstrate their wares. Levy, faced with a problem of connecting seven buildings within the Plainedge district, was looking for a solution to his own problems. After a brief conference with Adler, Dr. John A. Rinehart, Superintendent of Schools, and members of the Plainedge Board of Education gave official approval for a public demonstration of the Adler system in the Plainedge school district.[3]

Together with Levy, Adler applied in January 1962 for an experimental permit to relocate Adler's existing translator system from the Adler research facilities in New Rochelle to the Plainedge school district. The Construction

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[1] Dalton Levy, "Operational ETV on 2 Km/c," Educational Screen and A-V Guide, Adler reprint, n.p.

[2] Levy, personal interview.

[3] Levy, "Operational ETV on 2 Km/c."

Permit was approved by the Commission on January 25, 1962.[1] The system designed by Adler was described in the FCC "Notice of Proposed Rule Making" on ITFS as follows:

> With the cooperation of the Union Free School District Number 18 of New York, an experimental system has been established at Plainedge, Long Island, New York, with a transmitter operating in the channel 2008-2014 Mc/s. The transmitter provides 10 watts peak power output and 1 watt average aural power. The transmitter output is fed into two broadbeam directive transmitting antennas, mounted on the Plainedge High School Building, 72 feet above ground, and aimed in approximately opposite directions. Each antenna provides an effective radiated power of 136 watts and an excellent signal is provided to seven individual school buildings scattered through the town. At each school building, a single receiver-converter is installed which picks up the 2,000 Mc/s signal, converts it to Channel 6 and feeds it into a master antenna distribution system where it goes to the individual classrooms for display on conventional TV receivers.[2]

Stanley Lapin, who had worked on the technical specifications for the Plainedge demonstration, later described the installation in greater detail:

> A 10-watt, 2,000 megacycle transmitter was installed at the high school, and receiving converters were installed at each of the other seven schools, on an experimental basis. The exciter unit is located in the studio control room, and the 10-watt transmitter is installed in an available space backstage at the high school auditorium. This transmitter is only about 20" x 20" x 40", and draws only 800 watts of AC power. It operates unattended.

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[1] Federal Communications Commission files.

[2] Federal Communications Commission, Docket No. 14744, Notice of Proposed Rule Making, FCC 62-868, adopted July 25, 1962, p. 3.

> Because of the shape of the school district, long and narrow, a bi-directional transmitting antenna was utilized in this installation. It is composed of an array of eight simple corner reflectors. The net result is an effective radiated power of 136 watts in a northerly direction, and 136 watts in a southerly direction....
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> At the seven receiving schools, receiving antennas and converters were installed. The converter output, on Channel 6, was fed into the distribution system in each building, together with the off-air signals of the seven New York City VHF television stations.
>
> Different style receiving antennas were utilized at the seven schools depending on the distance of each school from the transmitter. At nearby schools, a simple corner reflector antenna was used. At schools a little farther away, use was made of an array of two corner reflectors. At the Northedge Schools, farthest from the high school transmitter, a 4-foot parabolic antenna was utilized.[1]

The Plainedge demonstration was billed as a gala event for the instructional television industry. Commissioner Robert E. Lee of the FCC and an audience of 200 school administrators, audiovisual specialists, broadcasters, military personnel, staff members of the Department of Health, Education and Welfare as well as of the FCC, converged on Plainedge on June 19, 1962, to witness the first in-school demonstration of the new facility.[2] Ray Graf of the New

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[1] Stanley P. Lapin, "The On-Air, Closed Circuit Method of Instructional Television Distribution," in Instructional Broadcasting, proceedings of the National Association of Educational Broadcasters Conference, May 13-15, 1963, University of Illinois (Washington, D.C.: National Association of Educational Broadcaster, 1963), p. 69.

[2] Dalton Levy, "Operational ETV on 2 Km/c," Educational Screen and Audiovisual Guide, Adler Electronics reprint.

York State Department of Education later recalled that "Adler provided the equipment, Levy the cookies, and all enjoyed a twenty-minute "Parlons Francais" film, all the time lauding the system that had carried both audio and visual signal a distance of 3½ miles.[1]

Commissioner Lee, addressing the assembled viewers, optimistically observed that "the prospect of in-school television at a price that most school systems can afford is tremendously heightened by the potential offered in the band of frequencies between 1990 and 2110 Mc. You may be assured, he told his audience, "the Commission is giving most careful scrutiny to the possible development of this band of frequencies."[2] The Plainedge experiment was, in fact, a technical success. School Superintendent Rinehart enthusiastically reported that

> This is a tremendous breakthrough in coordinating individual school buildings with the studio. The operation of the equipment has been perfect and, moreover, it is extremely economical to maintain.[3]

Though problems arose, most were caused by the studio equipment rather than the Adler transmitters and receivers. A month after the demonstration Levy reported that he "found enthusiasm running extremely high for the continuation and expansion of this inexpensive method of disseminating ETV programs within the school district."[1] Later, Levy recalled that several problems, including poor video signal, lack of switching and fading equipment, and video tape equipment, occurred simultaneously with the installation of the 2000 MHz system; because of these problems television at Plainedge was not always well received "though the Adler microwave system worked to perfection."[2]

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[1] Graf, private interview.

[2] Robert E. Lee, Remarks delivered at the demonstration of on-air closed-circuit 2,000 megacycle ETV (Plainedge, Long Island, New York, June 14, 1962). (Mimeographed.)

[3] Superintendent John Rinehart, quoted in "A new concept in television for education," Litton Industries promotional brochure, n.p.

Establishment of ITFS (Docket No. 14744)

Proposed rules

Commissioner Lee had told his Plainedge audience in June that "it is expected that within the month [the FCC] will promulgate the necessary formal proceedings looking toward the inception of this type of service on a regular basis."[3] The new service was actually private communication and as such would have come within the province of the Safety and Special Radio Services Bureau of the Commission.

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[1] Statement presented to the Federal Communications Commission by Dalton Levy in support of Docket No. 14744. (Mimeographed.)

[2] Ibid.

[3] Lee, "Remarks," p. 5.

Since Parker had been involved with the preliminaries, however, the service was identified as a "supplementary broadcast service" and sent to the FCC Broadcast Bureau. The task fell to Parker to draw up proposed rules to govern the service.[1] The highly technical rules proposed by Parker are summarized in the Commission's "Notice of Proposed Rulemaking" dated July 25, 1962:

> The service is classed as a multiple-address fixed service and will operate as a supplement to the educational television broadcasting service. The service will be administered under Part 4 of the Commission Rules. The rules are designed to meet the needs of educators in several ways. The simplest system will consist of a central transmitting station or stations transmitting instructional and cultural material to one or more school buildings for use in classroom instruction. If needed, receivers can also be located at other selected locations including the homes of individual students. In some cases, the nature of the terrain or the extent of the area to be served will make it impossible to provide the needed service from a single central location. In such instances, transmitters will be licensed as "repeaters" placed at strategic locations to serve areas that are not served by the central station. In some areas it will be desirable to interconnect systems operated by different jurisdictions or operated in different areas by the same jurisdiction. The rules will permit the use of transmitters as relay stations to interconnect such systems. Finally, there may be a need to deliver the instructional programs carried by the school system, to an educational or commercial broadcasting station to the closed circuit system. The rules will provide for such use.[2]

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[1] Parker, private interview.

[2] Notice of Proposed Rule Making, Docket No. 14744, pp. 4--5.

With regard to transmission standards, Parker's proposed rules called for existing television broadcast station standards to apply to the new service. This standardization of transmission permitted the use of conventional TV receivers for displaying the programs in individual classrooms. The Commission proposed some modifications of broadcast standards, also explained in the Notice of Proposed Rulemaking of July 25:

> It may be possible to relax some of the more strict tolerances that broadcast stations must observe. We have ... proposed a less stringent frequency tolerance; a lower aural to visual power ratio; less attenuation of spurious omissions; considerable latitude in the choice of polarization; and, provision for remote control and in some cases unattended operation of the transmitters. These measures are intended to reduce the cost of installation and operation of these stations.[1]

Analyzing the existing spectrum use, Parker proposed that the 1990-2110 MHz band, in which the Plainedge experiment was operating, be reserved for the new service. This 2000 MHz band, commonly known as the Broadcast Auxiliary band, was occupied by studio-to-transmitter links (STL) and inter-city relay systems.[2] Parker's draft of proposed rules called for the STL's to be moved to another part of the microwave spectrum; this would provide within the reserved spectrum 20 six-MHz wide television channels for a geographic region.[1]

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[1] *Ibid.*, p. 5.

[2] Parker, private interview.

The Office of the Chief Engineer, in reviewing Parker's draft, proposed reserving instead the 2500-2690 MHz band, previously allocated to International Control and Operation Fixed stations.[2] Since industrial use of the 2500 MHz band was light, the Chief Engineer proposed a shared plan whereby the industrial users would share the band but no new authorizations in those services would be granted after the new service was regularized.[3] The expressed advantage of the 2500 MHz band was that it would provide 31 standard six-MHz television signals rather than the 20 available in the 2000 range.[4]

Notice of Proposed Rule Making

In its Notice of Proposed Rulemaking of July 25, 1962, the Commission invited comments from educational interests on the proposed rules, with special reference to "contemplated uses for a service of this kind, the number of channels that might be needed in a single system, typical areas to be covered, the kinds of material that may be transmitted over the system, the extent to which interconnection of systems may be employed (and) time schedules of when such service might be inaugurated."[1] Television broadcast interests were invited to comment on "the feasibility of the proposed sharing of this band with TV auxiliaries, the extent to which they will cooperate in planning and engineering their auxiliary systems to permit the fullest use of this band both by broadcast auxiliaries and educational fixed systems, the advantages or disadvantages of employing 6 Mc/s channels with suitable equipment for broadcast auxiliary purposes, and other matters of concern to broadcasters."[2]

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[1] See Appendix

[2] Notice of Proposed Rule Making, Docket No. 14744, p. 2.

[3] Parker, private interview.

[4] Notice of Proposed Rule Making, Docket No. 14744, p. 2.

Selection of 2500 MHz band

In its Report and Order on Docket 14744 the Commission noted that "the list of educational organizations and institutions which enthusiastically endorsed the proposed new service is impressive."[3] The majority of the comments submitted by educational interests simply supported the establishment of the new service. Although some groups recommended other modification of the proposed rules, the majority of the educational groups

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[1] *Ibid.*, pp. 5-6.

[2] *Ibid.*, p. 6.

[3] Federal Communications Commission, *Docket No. 14744*, Report and Order, FCC 63-722, adopted July 25, 1963, p. 2.

> expressed no preference for one or the other of the alternate frequency bands proposed. In most cases where a preference for the 2500-2690 Mc/s was indicated it was based simply on the fact that it contained 31 channels as compared to the 1990-2110 Mc/s band which contains only 20 channels. Where a preference for the lower band was indicated it was based on the current availability of equipment and the fear that there would be delay in development of suitable equipment for operation in the upper band.[1]

The majority of the comments submitted by broadcast and manufacturing interests, on the other hand, dealt with the problem of frequency band selection. Arguments for the 2000 MHz band were forthcoming from the manufacturers of translator equipment who maintained that the adoption of the lower frequency band would insure prompt utilization of the service since several manufacturers were producing microwave equipment capable of transmitting television signals at this frequency. Modifications of existing equipment would be necessary for the new service, but these modifications would be minor; equipment would be available immediately after adoption of the rules. Further, they argued, omnidirectional antennas, corner reflector antennas and parabolic antennas would be readily available in the 1990-2110 MHz band, while only parabolic antennas were available in the

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[1] Ibid., p. 4.

2500-2690 MHz level. The necessity of producing new equipment in the 2500 MHz band, they maintained, would be expensive.[1]

Lapin quoted several specific figures to document his allegation of higher expenses in the 2500 MHz range:

> Equipment operating in the 2500-2690 Mc band ... would be considerably more expensive than equipment operating in the 1990-2110 Mc band. A leading tube manufacturer has furnished information that the commonly utilized tube in these equipments ... has an efficiency at 2700 megacycles which is only 1/3 of the efficiency of this same tube operating at 2000 megacycles. Such a substantial drop in the efficiency of operation of this tube means either utilizing a greater number of stages in the equipment, or going to tubes which cost more than three times as much....
>
> In addition to the power amplifier stages, the higher of the two proposed frequency bands requires the use of higher cost tubes in many other circuits of the transmitter, and likewise imposes additional cost on the receiving converters necessary at each receiving point. It is estimated that a transmitter operating in the 2500-2690 Mc band may cost 50% more than one operating in the 1990-2110 Mc band.[2]

Proponents of the 2500 MHz frequency, on the other hand, pointed out that, although no suitable equipment was being designed or manufactured at that band, there would be only a short time lag before the equipment could be made available; this time lag could not be considered to be a deciding factor. "Manufacturers stated that such equipment could be developed and indicated that they would pursue such development if the service were placed in the upper band.[1] Further, these manufacturers contended that the 2500 MHz equipment, when it was produced, would actually serve better the ultimate purposes of the new service. In summary, the Commission rules that:

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[1] Ibid., p. 5.

[2] Stanley Lapin, "Proposed Educational Uses of the 1990-2110 Mc Band," remarks delivered at the 38th Annual Convention of the National Association of Educational Broadcasters, Philadelphia, Pennsylvania, October 24, 1962. (Mimeographed.)

> Although equipment suitable for use in the 1990-2110 Mc/s band has been developed and produced by at least one manufacturer, there would be a time delay before the equipment could be produced in quantity either by the present manufacturer or others entering the field.... In any event, comments from the various educational interests indicate that system planning and resultant budget problems in connection with the provision of instructional television will induce a delay in actual operational implementation. Consequently, we do not regard the manufacturing "time lag" as being of paramount or overriding importance in selecting either frequency band.[2]

One factor supporting the selection of the higher frequency band was the fact that its use by Operational Fixed Services was light. There were approximately 90 outstanding authorizations for the band at the time of the Rule Making; these were judged to not interfere with the educational purposes envisioned by the Commission. The Commission held that "the relative lack of use of the band by other systems (would) decrease, for educational users, the engineering burdens of providing interference protection to other systems in this band."[1]

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[1] Report and Order, Docket No. 14744, p. 3.

[2] Ibid., p. 5.

As for the cost factor, the Commission maintained that costs would be reduced by the very fact that the market for this new type of equipment would be expanded. "The cost differential would be reduced by the added marketing incentive to develop equipment in the 2500-2690 Mc/s band."[2]

A few comments submitted to the Commission suggested that the anticipated needs of education warranted the reservation of both the 2500 and 2000 MHz bands. Dr. Lyle W. Ashby, Deputy Executive Secretary of the National Education Association testified that:

> The National Education Association supports the Commission's proposal to establish a new class of educational television service to be used primarily for the transmission of instructional and cultural materials to multiple receiving locations on channels in the 1990-2110 Mc/s and 2500-2690 Mc/s frequency band.[3]

In the light of conflicting testimony, the Commission ruled that the reserved channels would fall within the 2500-2690 MHz band. In explaining its action, the Commission reported:

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[1] Ibid., p. 5.

[2] Ibid., p. 5.

[3] Statement submitted to the Federal Communications Commission by Dr. Lyle W. Ashby in support of Docket No. 14744, November 19, 1962, p. 1.

> (After considering the aforementioned comments) it is the Commission's belief that, since propagation characteristics are essentially the same in either band, and because the new service can be implemented with the least disruption to existing services, the instructional television service should be established in the 2500-2690 Mc/s band. The relative lack of use of the band by other systems will decrease, for educational users, the engineering burdens of providing interference protection to other systems in this band. The wider band will provide opportunity for 31 television channels as opposed to 20 in the lower band, thus meeting the criteria for expansion and facilitating system design. It is the Commission's opinion that the cost differential would be reduced by the added marketing incentive to develop equipment in the 2500-2690 Mc/s band.[1]

Review of band use

A compromise was reached in order to protect the interests of the Operational Fixed Services operating in the 2500-2690 MHz band. For the time being, such services could continue to operate within the band; at the end of three years a review would be made of the educational use of the band. If use justified, consideration would be given at that time to a proposal to reserve the band exclusively for ITFS. In the interim, industrial users of the 2500 MHz band would be required to adhere to the same technical specifications as the new educational users:

> Because we have no firm foundation on which to evaluate the ultimate needs of the proposed service, a reallocation of the 2500-2690 Mc/s band from the operational fixed service to instructional television is not being enacted at this time. Instead, the Commission is

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[1] Report and Order, Docket No. 14744, p. 5.

> providing a three-year period during which no new operational fixed systems will be authorized in the 2500-2690 Mc/s band, except as follows: Modification or expansion of existing systems will be permitted; and persons eligible for operational fixed stations in this band may use the band for television transmission if the technical characteristics of the equipment meet the technical standards set forth in Part 4 for instructional television fixed systems.[1]

This technical restriction was necessary because, under ordinary circumstances, the bandwidth occupied by the industrial users would be wider than the 6 MHz occupied by the audio and video signals authorized for ITFS. Failure to comply with the FCC standards for ITFS would cause unnecessary interference from industrial users.[2]

Educational uses

A second question considered by the Commission in its Rule Making concerned contemplated uses for the new service. Parker's draft proposed that permissible service include transmission to

> public and parochial schools, college and university buildings, hospitals, nursing offices, business establishments, industrial plants, private homes, and other similar places, for the purpose of formal education, in-service training, instruction in special skills and safety programs, extension of professional training, keeping professional and semi-professional persons abreast of current developments in particular fields, and other similar endeavors. During periods when the circuits are not being used for the foregoing purposes,

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[1] Report and Order, Docket No. 14744, p. 6.

[2] Parker, private interview.

> administrative traffic may be transmitted. However, educational television fixed stations will be not authorized for the sole purpose of handling administrative traffic.[1]

The question considered by the Commissioners was whether the service would be strictly limited to instructional television or whether other types of transmission would be permitted. In a compromise policy decision, the uses of the service were divided into "primary" and "secondary" types. According to Section 74.931 of the *FCC Rules and Regulations* the primary purpose of ITFS is defined as follows:

> Instructional television fixed stations are intended primarily to provide a means for the transmission of instructional and cultural material in visual form with an associated aural channel to specified receiving locations for the primary purpose of *providing a formal education and cultural development* to students enrolled in accredited public and private schools, colleges and universities. (Italics mine)[2]

The primary use of ITFS was thus strictly limited in the original Rule Making. This insistence on a primary instructional purpose was to distinguish those who could apply for and hold an ITFS license from those who might incidentally use or borrow time on an existing channel. The Commission foresaw difficulties in being able "to fit the expected demand for the proposed new service into the available spectrum space," and concluded "it would not be in the public interest to create a demand far in excess of the capacity of the band."[1]

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[1] Appendix to Notice of Proposed Rule Making, *Docket No. 14744*, p. 3.

[2] Federal Communications Commission, *Rules and Regulations*, Section 74:931.

On the other hand, the intention of the Commission was to develop the full potential of the medium. Towards this end, it designated "secondary" uses for ITFS:

> Such stations may also be used for the additional purpose of transmitting visual and aural material to selected receiving locations for in-service training and instruction in special skills and safety programs, extension of professional training, informing persons and groups engaged in professional and technical activities of current developments in their particular fields, and other similar endeavors.[2]

Another secondary use of an existing ITFS, the transmission of administrative activities, was authorized, but strictly limited, in the Rule Making:

> During periods when the circuits provided by these stations are not being used for the transmission of instructional and cultural material, they may be used for the transmission of material directly related to the administrative activities of the licensee, such as the holding of conferences with personnel, distribution of reports and assignments, exchange of data and statistics, and other similar uses. Stations will not be licensed in this service solely for the transmission of administrative traffic.[3]

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[1] Report and Order, Docket No. 14744, p. 9.

[2] FCC, Rules and Regulations, Section 74:931.

[3] Ibid.

Relay stations

In order to extend the coverage of an ITFS facility, the Commission authorized the licensing of relay stations

> to interconnect instructional television fixed station systems in adjacent areas, to deliver instructional and cultural material to commercial and noncommercial education broadcast station, to obtain program material from commercial and noncommercial educational television broadcast stations for use on the instructional television fixed system, and to deliver instructional and cultural material to and obtain such material from nearby terminals or connection points of closed circuit educational television systems.[1]

Parker's original proposal would have allowed stations licensed as ITFS systems to be used as relay stations to interconnect television fixed systems in different areas. The proposal was changed to limit relay from one area of a common system to another area of the same system and to the exchange of program material between adjacent or nearby systems operated by different licensees. This change was made to preclude the establishment of relay systems to distribute material over an entire state or a large portion thereof. Microwave transmission, authorized in the Business Radio Service, could provide this extensive relay facility; the Commission ruled that "no need exists for establishing a parallel service under these rules."[2]

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[1] Ibid.

[2] Report and Order, Docket No. 14744, p. 8.

Eligibility

The Commission next considered requirements for eligibility to hold licenses in the new service. Parker's original draft limited eligibility in the new service to institutional organizations, e.g. accredited public and private schools or colleges and universities engaged in a program of formal education. Testimony presented to the Commission later proposed that anyone eligible to hold a non-commercial educational television license would be eligible in the new service. The Commission ruled that:

> After considering the comments we have decided to make eligibility in the service identical with our non-commercial educational TV broadcast service. A community group formed for the purpose of operating an educational broadcast station would be eligible. Individual members of the group who are engaged in the operation of an educational system could be eligible.[1]

However, the Commission ruled several other groups ineligible for licenses in the new service:

> Since the total requirements of those engaged in formal education are as yet unknown and may conceivably tax the capacity of the band, it would be premature to consider permitting commercial organizations such as private vocational schools, professional associations, language schools, dancing academies, etc. to use the channels.
>
> We have also considered suggestions that municipalities be made eligible to use the new service in connection with the public safety and welfare activities of the police, fire and public health departments. Such uses might include the training of policemen, doctors and nurses and the transmission of line-ups of criminals to

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[1] Ibid., p. 9.

> the various police precincts. While these are worthwhile municipal activities, we have not provided for eligibility under the new service to municipalities for such purposes, feeling that they should and can more appropriately be conducted through the use of facilities licensed under the rules of the public safety radio services.[1]

Channel limitations

Another matter considered by the Commission in its Rule Making was the number of channels that could be held by an individual licensee. Parker's draft proposal called for "no numerical limit" upon the number of channels which could be assigned to a single licensee, but did caution that

> Applicants are expected to plan systems so as to use the fewest number of channels needed to perform the required service. The Commission may require applicants to review proposed systems if in its opinion the number of channels requested is excessive.[2]

In this situation, the Commission faced the same problem it had encountered in allocating UHF and VHF channels for educational television: there was no basis on which to predict the kind of extent of the uses of ITFS. The Commission did attempt to "place a numerical limit of the number of channels available to a single licensee in a given area until we are able to make a more accurate estimate of the potential demand for channels and have gained experience in the effectiveness of geometric arrangements of assignments."[1] Arbitrarily, the Commission ruled that an applicant was limited to no more than five channels to serve a single area, this ruling did not preclude the assignment of additional channels to service a different area. Moreover, the Commission ruled that "in individual cases, more than five channels may be assigned to a single licensee upon a satisfactory showing of need and after a determination has been made that such additional assignments may be made without depriving other eligible users of adequate availability of channels."[2]

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[1] Ibid., p. 9.

[2] Appendix to Notice of Proposed Rule Making, Docket No. 14744, p. 2.

Grouping of channels

The Commissioners further attempted to "provide a pattern for inter-leaving assignment to meet the needs of several closely spaced by independent school systems."[3] Towards this end, the 31 allocated channels were divided into six groups with each licensee required to select all of its five channels from the same group. This initial grouping provided a separation of five channels (30 MHz) between assignments used by a single licensee in a single community. Again this "original choice of channel grouping was based upon lack of technical data rather than consideration of technical knowledge."[1] In allowing this arrangement, that Commission maintained that it "did not mean to assert that the 6 channel separation was necessary but that arrangement was convenient and symmetrical and gives us the flexibility of providing two, three, four or five channel separation between assignments to different licensees in the same area."[2]

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[1] Report and Order, Docket No. 14744, p. 7.

[2] FCC Rules and Regulations, Section 74.902(c).

[3] Report and Order, Docket No. 14744, p. 7.

Power limitations

In order to insure that channel allocations could be repeated in adjoining areas without signal interference, the FCC placed power limitations on ITFS. The power of the system was "limited to that required to perform the proposed service" taking full advantage of the "power-concentrating properties of directive transmitting antennas and the collective properties of directive receiving antennas to provide the needed service."[3] Since ITFS was a point-to-point service, travelling basically in a straight line-of-sight path, several factors influenced the design of the system. To insure the consideration of these variables by applicants, the Commission ruled that:

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[1] Federal Communications Commission, Docket No. 15181, Notice of Proposed Rule Making, FCC 63-887, adopted October 3, 1963, p. 2.

[2] Ibid.

[3] FCC Rules and Regulations, Section 74:935.

> An application for a new educational television fixed station or for changes in the facilities of an existing station proposing a peak visual power output from the transmitter in excess of 10 watts, shall include a showing as to the distance and direction to each specified receiving point, the elevation above ground and the power gain of each receiving antenna at such receiving points, the vertical and horizontal directive patterns of the proposed transmitting antenna system in terms of power gain, the elevation of the transmitting antenna above ground and the nature of significant terrain features over the transmission path or path.[1]

Commenting on this regulation, Kessler notes that

> The 10-watt power limitations available in the ITFS service combined with the line-of-sight propagation characteristics of 2500-2690 MHz frequency assignments lend themselves very well to the use of all of these well-known interference reduction techniques so that the same channel group can be used again within 15 to 20 miles of each other without objectionable interference. Since the service range of ITFS transmission is influenced by the line-of-sight propagation characteristics of the horizon more than the power radiated from the antenna, there is little to be gained by going to higher transmitter powers, as has been frequently proposed but wisely resisted by the FCC. An elevated antenna provides a direct line-of-sight distance in statute miles to the horizon approximately equal to 40% greater than the square root of the elevation above the terrain in feet....
>
> Beyond the horizon, or in the so-called radio shadow zone, the useful signal strength drops off very rapidly with increasing distance and soon becomes useless. This is much more pronounced at ITFS frequencies than the more familiar UHF/VHF broadcasting frequencies and thus constitutes a useful form of terrain shielding between contiguous systems using the same channel group.[2]

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[1] Ibid.

[2] Kessler, Technical Requirements, pp. 2-3.

The technical operation of the proposed system drew few comments from education or broadcast interests. Parker's draft proposal, amended to authorize 2500 MHz rather than 2000 MHz transmission, was adopted by the Commission. On July 25, 1963, just one year after the notice of proposed rule making, the Commission adopted the Report and Order in Docket 14744 establishing a new class of educational stations to be known as Instructional Television Fixed Stations.

Change in Frequency Assignment Table

Even before the first application for an ITFS construction permit was submitted, the Commission received a petition from Adler Electronics to change the frequency assignment table. In the petition, filed August 30, 1963, Adler "claimed that the suggested new grouping would permit the use of a single receiving for the simultaneous reception of as many as four channels thus resulting in a substantial saving in costs to individual licensees."[1] This alleged saving would result from the assignment of alternate channels, with only six MHz separation, to a single licensee in a single community. Assignment on this alternate channel basis, according to Adler, would permit the use of wideband frequency converters; one such converter would be able to receive as many as four programs simultaneously at no increase over the cost of a converter for reception of a single channel.[1]

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[1] Federal Communications Commission, Docket No. 15181, Report and Order, FCC 64-466, adopted May 20, 1964, p. 1.

> This argument assumes that double conversion will be common practice, i.e. a receiver-converter will receive the 2500 Mc/s signals and through the use of a heterodyning oscillator, convert them to a standard VHF television channel.... If channel assignments are made on an alternate channel basis in the 2,500 Mc/s band the products of the heterodyning oscillator in the 2,500 Mc/s receiver-converter may be made to fall on alternate VHF channels.[2]

The Commission was skeptical of the Adler proposal, concerned that the proposal

> may raise some technical problems in connection with adjacent channel interference and intermodulation, especially since some of the antennas that may be used may not be highly directive. These factors may depend upon the nature of the system, whether the received signals originate at the same location, etc. While many of the educational users may plan to locate all of their transmitters at a single location we anticipated that circumstances might arise where they would divide the transmitters between two or more locations. Furthermore, the sharing of this band by industrial users complicates the problem since they will in most cases be single channel operations and the use of a common site by several different licensees in that service would be sheer coincidence.[3]

In light of the arbitrary division specified in the Rule Making on Docket 14744 the Commission expressed willingness to explore Adler's proposal to weigh the savings to multi-channel users against disadvantages with respect to curtailment of the availability of channels to all prospective users. On October 3, 1963, the Commission invited comments on the Adler proposal, requesting specific comments based on engineering judgment in lieu of actual experience with ITFS.

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[1] Notice of Proposed Rule Making, Docket No. 15181, p. 1.

[2] Ibid., p. 1.

[3] Ibid., p. 2.

> We are particularly interested in actual experimental data on the necessary ratio of desired to undesired signals for interference-free reception when stations are operated on alternate channels. We would also like data on the required desired to undesired signal ratio between stations operating on adjacent channels and at other channel separations both with broadband receivers of the type proposed by Adler and single channel receivers with reasonable selectivity built into the intermediate frequency amplifiers both with respect to signal interference and intermodulation.... We would also like to have some estimates as to the probable range of costs of single channel receivers as compared to wide-band multi-channel receivers of equal sensitivity and the difference in sensitivity at approximately the same price.[1]

Several comments were filed by public school systems and colleges "simply endorsing the proposal because of the prospect of saving in the cost of equipment."[2] Other comments, filed primarily by manufacturers of microwave equipment, were directed toward the technical aspects of the proposal.

The principal objection to the Adler proposal was the possible technical preclusion of two-way TV systems if assignments were limited to an alternate channel assignment. To this objection Adler responded that two-way transmission would usually involve separate licensees who would not be required to use channels in the same group. The Detroit Public Schools offered a "novel suggestion, i.e. the possibility of altering the tuning of conventional TV receivers slightly to increase the number of alternate channels available."[1] Although the Commission did not follow through on the suggestion, it ruled that:

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[1] Ibid., p. 2.

[2] Report and Order, Docket No. 15181, p. 1.

> Such technique would not require the radiation of signals on the offset channels and would not be inconsistent with any rules or regulations of the Commission. While the technical specifications for this service were designed so that conventional TV receivers could be used for displaying the program material, there is nothing in the rules that requires the use of conventional TV receivers and the incoming signals may be converted to any suitable frequency for distribution over a wired system within each reception point.[2]

A recommendation filed by Micro-Link Corporation, supporting but revising slightly the Adler proposal, was ultimately adopted by the Commission. This proposal supported the objective of the Adler proposal because of the economical possibilities, but proposed an alternative to channel groupings suggested by Adler:

> It differed with Adler as to the number of channels per group and the number of groups of channels. Micro-Link

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[1] Ibid., p. 3.

[2] Ibid., p. 3.

> suggests that since a broadband converter will yield at most, 4-channel simultaneous reception, no useful purpose is served by placing more than 4 channels in each group. They further suggest that seven groups containing 4 channels each and an eighth group with 3 channels will provide greater flexibility in areas where a number of separate systems may wish to operate, than the present arrangement of 5 channels in five groups and 6 channels in a sixth group.[1]

In its final decision the Commission agreed with the Micro-Link thesis that there would be no particular advantage in including more than four alternate channels in any one group. No more than four equally spaced VHF channels would be accommodated on conventional television receivers used to display the signal. A licensee who wished to apply for five channels could select his fifth channel from one of the remaining groups. This system would provide the possibility of adequate channel separation for two-way communication where the transmitter and receiver were located in close proximity. The Commission adopted a revised table of assignments on July 1, 1964:[2] "As a result of the ruling on Docket 15181, no modifications are required at the receiving location in order to provide multiple-channel capability. The addition of ITFS transmitters at the transmitting site is all that is necessary."[3]

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[1] Ibid., p. 2.

[2] See Appendix

[3] Kessler, Technical Requirements, p. 6.

To underscore the multi-channel purpose of ITFS, the Commission reiterated that "the tentative reservation of channels ... is implicit in the Grouping idea." While some users might want to use only one or two channels, others would want to begin with a single channel and activate others at a later date. Therefore, the Commission ruled that an applicant for fewer than the total number of channels in a given group might request reservation of the remaining channels in that group for its use.[1] This request for channel reservations was not a guarantee that they would be reserved for any specified period of time, but the Commission agreed to make every effort to avoid channel assignments on reserved frequencies.

Although subsequent problems of saturation later limited to four the number of channels allocated to a single licensee within a single geographic area the table of frequency assignments adopted in July 1964 has not been changed. Thus, from a technical standpoint, the basic design of ITFS has not changed since the adoption of the amendments contained in Docket No. 15181.

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[1] Report and Order, Docket No. 15181, p. 4.

System Design

As structured by the Federal Communications Commission Instructional Television Fixed Services provides a comprehensive educational communications system, ranging from studio to classroom. Such systems design represented a departure for the Commission. As a federal agency, the FCC is responsible for the radio frequency spectrum; in the case of ITFS the Commission included within the system not only transmission of a television signal but the reception of that signal.

Because it is transmitted over the air, ITFS is analogous to broadcast television. The words "fixed service" clearly distinguish 2500 MHz transmission from broadcast facilities. The intent of the FCC through the use of this phrase was to draw a clear distinction "between television VHF/UHF broadcasting and a multiple-addressed fixed point-to-point service."[1] In its Report and Order on Docket No. 14744, establishing the new service, the FCC explained the significance of the term:

> The Commission made it abundantly clear in the Notice of Proposed Rule Making the proposed new service was intended to supplement the educational television broadcast service and not to replace it. However, several parties suggested that we call the new service

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[1] Kessler, Technical Requirements, p. 1.

> "Instructional Television Fixed Service" to avoid any confusion with the Educational Television Broadcast Service.[1]

On the other hand, because the loop is closed, with transmitter and receiver in the hands of the licensee, ITFS is analogous to closed circuit television. William Kessler describes the advantages of this systems approach:

> One of the more unique features (of ITFS) is that the receiving installation is an integral element of the overall design and thus receives an equal share of the system designer's attention. By contrast, the design of educational VHF/UHF broadcasting installations involves only the transmitting plant with little or no consideration to the receiving locations. The fundamental reason for the design approach is ... because the receiving installations are located predominately in homes for the purpose of receiving existing commerical stations and the quality of the antenna installation or the performance characteristics of the TV sets are not under the control of the system designer. Since the design of the receiving system *is* under the direct control of the design of the ITFS system, the quality of the received picture and sound provided in the school classroom is more uniform.[2]

This dual relationship is described in the 1967 publication entitled *ITFS: What it is ... How to plan*:

> ITFS is a private distribution system in which preselected receiving points are connected by radio signals instead of by cables.... ITFS is neither a broadcast (open-circuit) system nor a closed-circuit system in the sense of wired (cable) installations.[3]

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[1] Report and Order, *Docket 14744*, p. 7.

[2] Kessler, *Technical Requirements*, p. 5.

[3] Bernarr Cooper, Robert Hilliard, and Harold E. Wigren, ITFS: What It Is ... How to Plan (Washington, D.C.: National Education Association, 1967), pp. 12-13.

ITFS therefore complements broadcast and closed circuit television, serving to distribute televised instruction on a broad and multi-channel basis. "ITFS systems ... were never intended to be low-cost substitutes for UHF and VHF broadcasting."[1] On the other hand, ITFS offers the breadth of distribution, economy and technical standards not available in closed circuit television. The nature of this relationship is expressed by Kessler as follows:

> Since the 2500-2690 MHz frequency range is regarded as being in the microwave frequency spectrum and because standard VHF/UHF modulation standards are employed to permit classroom display with ordinary VHF TV receivers ... ITFS systems may be regarded as the product of a convenient marriage between point-to-point microwave frequencies and VHF/UHF broadcasting standards.
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> Further, the multi-channel capability provided by adding additional transmitters at the origination point ... and the wave propagation characteristics of the frequency range of 2500-2690 MHz established ITFS systems as a natural competitor, or more accurately an alternative to closed-circuit cable systems and FM microwave systems.[2]

The elements of the ITFS system are three: program originating equipment, transmitting equipment and receiving equipment. In summary, the characteristics of these elements may be outlined as follows:

1. Program originating equipment. Program originating equipment for ITFS is identical with that required for broadcast or closed-circuit systems. Studio equipment

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[1] Kessler, Technical Requirements, p. 1.

[2] Ibid., p. 2.

includes cameras, switchers, monitors, audio equipment, lighting equipment, test instruments, film chains, projectors, videotape recorders and related hardware. The amount and kind of studio equipment are determined by the needs and resources of the individual system.

2. Transmitting equipment. Transmitting equipment includes both the transmitter itself and the transmitting antenna:
   - A. Transmitter. The ITFS transmitter is a low power (10 watt maximum) transmitter which generates the signal within the 2500-2690 MHz frequency range and then superimposes on this signal the aural and visual signals which originated in the studio. The ITFS signal is sent by cable from the transmitter to the transmitting antenna.
   - B. Antenna. The transmitting antenna may be either highly directional or omnidirectional, depending on the geographic area to be covered. "By concentrating the power from the transmitter into desired vertical and horizontal planes, the effective radiated power will be several times the transmitter power output."[1]
3. Receiving equipment. There are four elements in the receiving equipment: receiving antenna, converter,

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[1] Cooper, et al., p. 35.

internal distribution system and classroom receiver.

A. Receiving antenna. "A receiving antenna is installed on the roof at each receiving location to absorb a sufficient amount of the signal (as radiated from the transmitting antenna to enable the receiving equipment to perform its particular service in the system."[1] The receiving antenna, directed at the transmitter, can enhance the desired signals and discriminate against unwanted signals.

B. Converter. The frequency converter "translates the microwave frequencies to the high-band VHF frequencies so that a standard TV set can be used as a classroom receiver. The converter ... process involves nothing more than electronically carrying out the mathematical operation of subtraction.... The sole function of the ITFS converter is to transform the microwave frequency to a standard VHF frequency.[2]

C. Internal distribution system. The signal is then carried from the down converter to the classroom by means of coaxial cable. The same cable can carry a closed circuit signal originating within the building. Because of the wired internal distribution system, a single antenna and converter serve an entire building.

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[1] Ibid., p. 34.

[2] Kessler, Technical Requirements, pp. 5-6.

D. Classroom receiver. The UTFS signal is received in the classroom on a conventional television set. In most operating systems the signal is received on alternate channels between VHF channels 2 and 13. The reason for this, as Kessler explains, is based not on characteristics of the receiver but on the cable distribution system:

> The signal losses encountered in a cable distribution system are almost directly proportional to the frequency of the signal. Since VHF channels are of lower frequency than the UHF channels it is common practice to distribute TV programs on the VFH channels even when they are picked upon on the UHF channels. The purpose of the VHF/UHF converter associated with the UHF channels-reflected antenna is conversion to a low VHF channel, much the same way that ITFS channels are converted to a group of high VHF channels.
>
> Most cable distribution systems provide distribution on alternate VHF channels only to minimize undesirable interference between channels. This is the fundamental reason that "converter" channels of ITFS systems appear on channels 7, 9, 11 and 13. However, by careful control of signal levels and adequate filtering of the lower sideband of the TV channels, satisfactory distribution is now possible on all VHF TV channels. Which such advanced systems simultaneously provide a total of 12 channels, the UHF-channel capability ... is generally useful for classroom use.

Anticipating a demand by educators for more closed-circuit channels, the industry has developed cables, cable components and cable amplifiers suitable for the efficient distribution of UHF channels.

Such systems provide enough additional channels for distribution to the classroom so that all the ITFS, VHF and UHF channels and any reasonable number of tape recorded programs of local origin can be distributed to the classroom.[1]

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[1] Ibid., p. 7.

Chapter III

Early Development of ITFS Systems

Response to Instructional Television Fixed Service was immediate and enthusiastic. The 1962 study of closed-circuit television mentions "the mushrooming interest in the experimental program at Bethpage, Long Island, in the use of on-air closed circuit television" and anticipates that "all types of closed-circuit installations will benefit and wider acceptance and use of CCTV will be assured" by the development of the 2500 MHz system.[1]

The first application for a construction permit for an ITFS system was filed by the Plainview, Long Island school system in January 1964. By September 28, 1964, the first two ITFS systems were operating at Plainview and in the Parma, Ohio, school system.[2] [The Plainedge system, in which the original experiments had been conducted, continued to operate according to its experimental license in the 2000 MHz range until May, 1964] By mid-1966 twelve ITFS systems were on the air and 52 construction permits for

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[1] DAVI, CCTV Survey, 1962, p. 69.

[2] Cooper, *et al*., p. 16.

156 ITFS channels had been granted by the Commission.[1]

These statistics do not tell the whole story, however, for, although facilities were planned and installed in several school systems, and although some of these were highly effective, ITFS, in its early development, failed on the whole to make a real impact on education.

Availability of equipment

An early problem in the development of the new system was the lack of adequate hardware. Though the Commission ruled that it would accept applications as early as September 1963, there was, as of that date, no available transmitting or receiving equipment. "ITFS was sold as an operational entity before the industry was operational technically."[2] Since the Plainedge demonstration had been conducted in the 2000 MHz band, there was not even a prototype of the 2500 MHz transmitting or receiving hardware. Lawrence Frymire, Chief of the FCC Educational Broadcast Branch during this time, estimates that the tool-up period required for the 2500 MHz hardware was eighteen months.[3] The Commission had realized this built-in delay in the original rule making but had judged that in the long run the equipment would be better and the portion of the spectrum better suited to the needs of education in the 2500 MHz range.[1]

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[1] Federal Communications Commission "Educational Television," Information Bulletin No. 16-B, June 1966.

[2] James Tintera, private interview in Detroit, Michigan, August 26, 1969.

[3] Frymire, private interview.

Companies involved in the production of microwave transmitting equipment promptly converted existing equipment for the newly authorized service. Since there was little time for field testing and re-design of the microwave equipment, much of the hardware sold during the early months of ITFS could not do the job for which it was purchased.[2] As a result, several early systems failed to perform well technically, causing disillusion on the part of some users with ITFS as a technical entity.

Such disappointment was unfortunate but remedial--if it were not symptomatic of a problem with much deeper roots. ITFS offered a unique opportunity for education and technology to work together, with a proven tool, to solve an existing problem. Since no hardware was on the market, education was in a position to dictate its needs to industries, to determine rather than adjust to equipment design. Ill-prepared in terms of experience, leadership and funding, education could not seize the opportunity. As a result, in many instances manufacturers' representatives determined the design of systems, not necessarily in the best interests of the school system to be served.

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[1] Frymire, private interview. Report and Order, Docket No. 14744.

[2] Frymire, private interview.

Educational Broadcasting interests

The needs of education for additional channel allocations had been stated and documented by the National Association of Educational Broadcasters, an organization "oriented and experienced in the out-of-school community cultural single channel open circuit broadcast ETV philosophy."[1] Foundation funds had long supported the public television concept to the point where the image of instructional television was to many synonymous with one method of organization and distribution. David D. Henry, President of the University of Illinois, observed that:

> There is still confusion in the public mind, and often within the academic profession, between educational broadcasting in general and instructional broadcasting as a specialized activity. Each area has its own boundaries, as the specialists know---one aimed at adult education, the other at classroom education. They overlap ... in use of facilities and sometimes in materials, but their purposes, and hence their methods and organization, are basically different.[2]

The NAEB also acknowledged this problem and attempted to grapple with it. In May 1963 the NAEB conducted a conference on Instructional Broadcasting attended by 200 educational broadcasters of broadcast and closed-circuit television and radio. In noting the inclusiveness of the conferences, President William Harley of the NAEB told his audience:

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[1] "Some State and National ETV Notes," TAE 111465 LMI, p. 6.

[2] McKenzie, p. 3.

> Instructional broadcasting is concerned primarily with the _purpose_, not the method of propagation, with the _goals_, not the means. The common bond that brings you _here_ is concern for improvement of instruction, not patriotism for a particular type of hardware or system of distribution.
>
> If the medium or technical system is emphasized the temptation is strong to make educational goals fit the means. Even if it is true that the "medium is the message", _people_ make decisions which the machine implements and our objectives here should be on the _use_ of these devices for valid instructional goals while at the same time helping to improve the capability of _people_ who can apply them effectively in the accomplishment of these goals.[1]

At this same conference Lewis Rhodes, then of Central Michigan University, presented the interface of "Time, the schools, and instructional broadcasting." It was a time, Rhodes said, "when our American system of education, which for the past decade has been seething and boiling with discontent, with change, with new ideas--is about to erupt."[2] Pressures being brought to bear on the traditional system of education "cut off just about every avenue of escape for the school, except one: Re-evaluate. Re-evaluate the function of the school; re-evaluate the roles of its participants;

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[1] _Ibid._, p. 6.

[2] _Ibid._, p. 20.

and even re-evaluate its form.... Faced with these pressures, education has few choices but to creatively study itself and produce some new plans for staff and time utilizations.... It is with this perspective--within this framework of "change"--that we must start looking at instructional television."[1]

Rhodes proposed vigorous action on the part of the broadcasters to "integrate televised instruction into the total instructional process." To do so, the broadcasters were presented with the following challenges.

> 1. We must find ways to put into practical use the information coming forth from the research into the learning and teaching processes. This means production and administrative personnel adequately schooled in learning and communication theory, with knowledge of the problems of the student, the teacher, as well as their own medium.
> 2. We must join forces with the others in education who are in effect our "blood brothers"--those working for better utilization of resources, personnel, time, and space, the leaders in programmed instruction, school design, and especially team teaching, since this concept is at the core of the integrated instructional system.
> 3. Finally, we, as professional communicators, must start communicating ... with the educators who are responsible for the changes that must take place ... but who are they?[2]

In spite of these sentiments and a token effort on the part of the public television people to communicate with in-school people, money, talent, organization and, above all, leadership, were inexorably vested in the community television interests. The first major federal support of educational television, PL 87-226, the Educational Television Act of 1962, did much to advance this philosophy by authorizing $32 million matching funds for broadcast out-of-school television, prohibiting federal support for the in-school multi-channel concept represented by ITFS. Historically, ETV interest in in-school instructional television was based not on faith in the in-school philosophy but on a recognition that support for a community station must come from many agencies, including the schools. The original intent of the ETV people had been to insure sufficient channels for out-of-school public television; reservation of a non-competitive portion of the radio spectrum for in-school instructional television served to relieve the pressure on the spectrum. Established ETV professional organizations assumed no concomitant responsibility for information dissemination or support of that phase of instructional television which belonged to formal in-school education.

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[1] Ibid., pp. 22-23.

[2] Ibid., p. 23.

Education's Responsibility

The FCC had discharged its responsibility by reserving the spectrum space to meet the needs of education. In its Rule Making the Commission extended to education full responsibility for the implementation of the system. To encourage creativity and the development of new strategies by education the Commission avoided rigid rules for ITFS ITFS was intended to "offer a whole new concept of instructional television" which would complement the stereotype . broadcast channel which, because of different goals, could not serve as a model for an in-school system.[1]

Therefore, it remained to education to define the role of ITFS as a complement to existing systems, to communicate to technology its required technical specifications, to disseminate to potential users information about both instructional and technical aspects of the system. In general, education lacked the vision, the experience, the organization and the leadership necessary to develop the potential at its disposal.

Definition of role of ITV

William Harley, in his foreword to the CCTV survey of 1962, specified the problem:

> There is evidence that we have not yet permitted television to alter our conventional methodology. For the most part, we present on closed-circuit television what was done in the classroom, with perhaps a few more "visuals" and to more students.
>
> Second, closed-circuit systems are often technically designed to use television in minimal ways that preclude its genuine instructional usefulness.[2]

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[1] Frymire, private interview.

[2] DAVI, CCTV Survey, 1962, p. ix.

Five years later, the study of CCTV/ITFS facilities conducted by the Department of Audiovisual Instruction, National Education Association, reviewed Harley's comments:

> There is evidence in this study that CCTV/ITFS instruction has remained more experimental in its approach to the solution of instructional problems than has broadcast ITV.
>
> We must still admit to Harley's first concern that CCTV has not caused a major revolution in instructional methodology -- all too often we still transmit the "talking teacher" augmented by a few audio-visual materials....
>
> Harley's second concern continues to be valid. As the use of CCTV grows, systems of minimal technical design will continue to dominate. Only relatively few systems have matured into high quality, versatile installations with technical standards comparable to those of broadcast television....[1]

In part, the problem is rooted in the apparent reluctance on the part of the educational structure to perceive the complementary roles of the teacher and educational communications media described by Rhodes:

> Just as ETV was created in the image of commercial television, ITV ... in many cases has been cast in the image of ETV ... the image that I would call "enrichment." And while I would be among the first to acknowledge enrichment, as well as magnification, or observation, or even direct teaching, as valid uses for the medium of communication that we call television -- I would also point out that "supplementing" the classroom teacher is not going to alleviate the basic problems of teaching and learning with which we are faced....

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[1] Department of Audiovisual Instruction, National Education Association. A Survey of Instructional Closed-Circuit Television, 1967. (Washington, D.C.: Department of Audiovisual Instruction, National Education Association, 1967), pp. 2-3.

The classroom teacher, as director of learning, has at his disposal various media for the presentation of information. Among these, an important complement to the role of the teacher, is instructional television. As a medium, television is too expensive to be supplementary; it must be geared, as Reverend Michael J. Dempsey of the Brooklyn Archdiocese observes, to the solution of immediate problems:

> Television must be deliberately made part and parcel of the educational machinery. Unless it is tied to the resolution of the real problems of education and not left on the periphery of the struggle, unless it is involved in direct instruction, ETV would be simply a waste of time, personnel and money.[1]

In fact, however, the emphasis of educators has continued to be on the presentation of materials. As a consequence, the failure of instructional television and ITFS in particular was inevitable and predictable. After thirty years of instructional television educators were still putting the burden of proof on the medium by asking the question: "Can TV teach?" This emphasis on the process of teaching rather than the process of learning precludes commitment to any instructional television by relegating it to a supplementary role as a teaching aid.

The National Project for the Improvement of Televised

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[1] Michael J. Dempsey, "The Promise of Microwave ETV," Catholic School Journal, LVI (January 1966), 21.

Instruction was operated by the National Association of Educational Broadcasters, under a Ford Foundation grant, during the three-year period from 1965 to 1968. The purpose of the Project was to develop and implement a program of "systematic and sustained efforts to improve the quality of instruction" through electronic communication technology.[1] During the early months of the Project a group of field consultants undertook several major consultancies for schools and colleges "whose familiarity with instructional television from 'experienced pioneer' to 'about-to-begin.'"[2] The final results of these field experiences is summarized in the report of the Project entitled Toward a Significant Difference:

> It soon became apparent that most institutions requesting assistance saw television as a "problem" that stood apart from their own concerns in instruction, administration or curriculum. A concept that viewed technology as a means for dealing with problems was lacking.
>
> While instructional television had grown rapidly, and in many areas was a large-scale educational activity, there was a lack of a clear understanding as to the place and varying functions of television and other technologies in the overall improvement of instruction. In many cases, the development of instructional television appeared to be the result of happenstance, individual enthusiasms, or their lack, current trends or

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[1] Toward a Significant Difference, final report of the National Project for the Improvement of Televised Instruction, 1965-1968 (Washington, D.C.: National Association of Educational Broadcasters, 1968), p. 7.

[2] Ibid., p. 10.

> local pressures rather than the result of real understanding of the relationship of this tool to immediate and long-range educational objectives.
>
> This lack of perspective appeared to be the underlying reason for the lack of genuine commitment by instructional and curriculum leadership to use fully this tool to effect dramatic changes in teaching or learning. Many curriculum personnel were aware of television offerings in their field of specialization but few of them were actively using the medium to accomplish their major aims. Consequently, instructional leaders gave only passive support to instructional television. Teachers, in turn, tended to ignore its value.
>
> In most institutions, such deficiencies in understanding and leadership commitments resulted in "policy" that television was to be only a supplementary learning resource for those classroom teachers who voluntarily chose to use it.
>
> This optional use led to spotty television receiver distribution. Some schools had one or two sets. Others had many. The number of sets often seemed to depend on such factors as the availability of federal funds, possession of local school funds or the affluence of the parent-teacher association rather than upon a policy of insuring coverage for all appropriate learners.[1]

Breitenfeld concludes in his 1968 study of the state of the art of instructional television that:

> Instructional television has made little impact on American Education. Commitment to the use of television is generally lacking on the part of administrators and teacher. While individual systems can claim some success, the simple imposition of television on traditional administrative and educational structures is usually disappointing. The medium itself cannot be blamed, however; the major reforms necessary are much more basic than any single medium. Our educational structure resembles the structures of our most decrepit urban sections, and massive renewal projects are necessary.[2]

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[1] Ibid., pp. 10-11.

[2] Breitenfeld, Instructional Television, p. 25.

Reflecting this sentiment, Ray Graf, of the New York State Department of Education, concludes that "historically speaking, television in general has done about all it could do considering the structure of traditional education."[1]

Because educators did not perceive the potential of ITFS as a unique medium, they thought of it in terms of the same kind of programming that was associated with broadcast ETV. This stereotype of instructional television was a poor model on which to base the development of in-school television at the disposal of education in ITFS. In 1964 Andereck criticized the stereotype of ITV:

> The way television was used as a teaching tool in the beginning is the way it is used today. We solve scheduling problems by repeating telecasts. You get schools to use more television by having them change bell schedules to match TV. Everybody uses the same formats, the same program lengths, the same teaching settings, the same puppets, the same financing methods, the same everything as when the first station went on the air. When open-circuit instructional television fails, we forgive it. We allow it to be inefficient because it is an infant. And yet, open-circuit television is the most inflexible infant you ever saw. Work rules and traditions are so firmly set that innovation is virtually unheard of. The way we operate instructional television facilities has become one of the biggest sacred cows and biggest white elephants in education.[2]

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[1] Graf, private interview.

[2] Barton L. Griffith and Donald W. MacLennan, eds., Improvement of Teaching by Television, proceedings of the National Conference of the National Association of Educational Broadcasters, University of Missouri, Columbia, Missouri, March 2-4, 1964 (Columbia: University of Missouri Press, 1964), p. 141.

Inexperience with ITV

Moreover, educators had limited experience with the technical aspects of television. Broadcast ITV had been left to the educational broadcasters outside of the school system framework. While the NAEB study in 1960 indicated that 543 of the 1,113 school systems responding to the survey were "using television to some extent,"[1] only 13 of the existing 60 ETV channels were owned and operated by public school systems.[2] The technical characteristics and the instructional purposes of even these few systems, which operated on a single channel open-circuit basis, were different from the multi-channel locally-controlled ITFS system. Those who had experience with closed-circuit television were equally unprepared for the expertise demanded by the nature and scope of an ITFS system:

> When the use of television first was introduced, it consisted of an installation properly termed "closed circuit TV". Its facilities and abilities were primarily limited within one building or compound which could easily be wired with coaxial cable. In 1963, however, the Federal Communications Commission announced allocation of 31 channels in the microwave frequency range of 2500-2686 (megacycles) for instructional purposes exclusively.
>
> In addition to imposing upon educational administrators the need for acquiring a new, highly technical vocabulary, this opened a Pandora's box of questions demanding

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[1] Needs, p. 43.

[2] Ibid., p. 15.

> solution regarding how to acquire permission for use of these channels, what sort of equipment to select for the best transmission from a technical as well as fiscal point of view and, finally, what uses such a TV network could have for school districts.[1]

Role of the FCC Educational Broadcasting Branch

When education did not assume the leadership in the development of ITFS, Frymire "became the mouthpiece of the new system, speaking at educational conferences and meeting with administrators privately to explain the advantages of 2500 MHz transmission."[2] Frymire echoed the sentiments of the original Report and Order on Docket 14744 in which "the Commission made it abundantly clear ... that the proposed new service was intended to supplement the educational television service and not replace it.[3] Frymire urged that ITFS systems be developed as distribution rather than original channels.[4] This concept was difficult to convey, however, because

> by the very nature of the system--economics, student population, etc.--it became obvious that the areas in which ITFS would develop would be the areas in which there was experience with ETV through the utilization

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[1] Edwin M. Perrin, "Points to consider in evaluating the merits of embarking into instructional television," Educational Equipment and Materials (Fall, 1965).

[2] Frymire, private interview.

[3] Report and Order, Docket No. 14744, p. 3.

[4] Frymire, private interview.

> of commercial and non-commercial as well as closed-circuit operations. These would be in the best position of readiness to develop systems of their own.[1]

Because they were working from outside the sphere of education, Frymire and other FCC staff members were severely limited in their efforts to inform and advise the educational community. There existed no instrument for communicating with educators. It was left to Frymire to travel to educational meetings and conventions, to try to talk personally with administrators who would be in positions to make decisions on instructional television. The agency did not have resources for travel and did not consider such apostolic work within its jurisdiction. Furthermore, since the responsibility of the Educational Broadcast Branch extends to all phases of educational television and radio, staff time was severely limited. Above all neither the federal agency nor any of the Commission staff as federal employees could offer advice regarding equipment manufacturers or consultants.

Manufacturers' claims

In spite of Frymire's emphasis on educational goals, the greatest appeal of ITFS to the local public school administrator were the features of local control and of economy. From the start, the Commission had predicted great savings to educators who planned ITFS systems. In its original Notice of Proposed Rule Making on Docket 14744 the FCC anticipated economy:

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[1] Ibid.

> Exact cost figures for such a system are not available but it has been estimated that a single-channel system of this type serving approximately 25 separate schools would require an investment of from one-fifth to one-third of the cost of a moderately powered TV broadcasting station serving the same purpose. This includes the special receiver-converters required at each receiving location to convert the signals to regular TV channels so that conventional TV receivers can be used in the individual classrooms.[1]

Echoing the Commission's promises, manufacturers offered educators savings in both capital outlay and operating expenses. Adler described its system in terms of these savings:

> 1. Low initial cost. The relative simplicity of the system entails correspondingly inexpensive equipment. To minimize initial outlay of funds, the school district may begin operation with only one channel. Subsequent additions, which may come gradually, do not require expensive, basic alterations of existing facilities.
>
> 2. Low operating cost. Designed for reliability the system requires only periodic maintenance at low cost, which is generally obtained through local service facilities. Savings on personnel requirements are substantial. Designed for continuous, unattended operation, ETV systems in the 2500 mc range do not require the full-time services of engineers or technicians holding 1st class FCC licenses, as is the case with conventional stations.

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[1] Notice of Proposed Rule Making, Docket No. 14744, p. 3.

> 3. Low installation cost. Equipment components are compact.... There are no elaborate or special installation procedures. The system can be installed in existing buildings. A modest and inexpensive support for the transmitting antenna replaces the tall, elaborate tower required by standard TV broadcast.[1]

Instructional goals

One of the points stressed by manufacturers' representatives was that, because all of the equipment would be in the hands of the school system, the main problem was one of original capital outlay. State funds such as those available through the New York State Education Department, made it possible for school systems to consider a one-time expense of this type. Also, school systems which had been contributing to the support of a public broadcasting channel, were able, by withdrawing that support, to purchase ITFS equipment.[2] Administrators failed to consider the broad base necessary to support and justify an instructional television system. Some looked to ITFS as local broadcast system, a small television empire locally controlled and designed to meet local scheduling needs. As a result, some small local ITFS systems were designed from the point of view of political expediency and empire building without clearly established educational goals.[1]

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[1] Adler promotional brochure, "Low cost multiple channel 2500 megacycle instructional TV service."

[2] Larry White, private interview held at the National Association of Educational Broadcasters, Washington, D.C., July 25, 1969.

School administrators who thought in terms of hardware and locally controlled broadcast rather than in terms of clearly established instructional goals, and who did not consider the long-range costs in terms of personnel, programming and production, were destined to suffer dissatisfaction with their systems from the standpoints of economy, performance and effectiveness. Weinberg warned these administrators that those

> who might view this form of instruction as an economic substitute do not begin on a correct premise. The success of this form of instruction will be assured when a library of outstanding courses can be brought into the classroom environment at modest cost with a degree of flexibility and trained classroom teachers, who can structure the programs with appropriate preparation and follow-up techniques.[2]

Weinberg's sentiments are shared by David W. Marxer, Director of Educational Media in the Huntsville (Alabama) Public Schools. After two years' experience with a major 2500 MHz system, Marxer contends:

> The use of TV to improve the learning process is our major objective, and costs can be justified through results of a thoroughly planned and executed program. Reduction of per-pupil cost can then be best accomplished by rough maximum use of quality television instruction, for it costs little more to serve many classrooms than few.

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[1] Bernarr Cooper, private interview held in Albany, New York, August 27, 1969.

[2] Philip Weinberg, "Microwave ETV: A New Dimension," School Board Journal (September, 1966), p. 23.

> We feel that the use of TV purely to reduce instructional costs in general will result in a decrease in effective learning in our school system.
>
> Instructional television must be used by the classroom teacher to effect desirable learning results. What can be taught successfully by television is debatable. What can be taught more effectively with television is practically unlimited.[1]

Organizational structure

The attitude of the administration towards ITFS determined the placement of the television facility within the administrative framework. As Breitenfeld observes, the problem exists within any type of instructional television system:

> We have tended to approach ITV as a medium ... and have generally tried to impose it on existing organizational and administrative structures. This has led, time and again, to disappointment.[2]

The problem is that

> most school systems simply cannot house divisions of television.... The reasons is that the approach is through media, at the convenience of current administrative patterns. If the approach were made through learning, then choices of techniques and media would become common decisions for all administrators, teachers and organizational divisions.[3]

Because of the particular skills needed to operate an ITFS facility, it was frequently assigned to staff more familiar with broadcast techniques than with education techniques. According to Larry White, staff member of the NAEB, school administrators called in "show people" to operate their instructional television systems. "The problem is not how someone from the outside can use a mechanical device, but how someone on the inside can use his own mechanism." Television has remained a mechanism, not a serious means of education.[1]

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[1] David W. Marxer in "ETV/ITV: Tool or Toy?" Broadcast Management/Engineering (November 1968), p. 40.

[2] Breitenfeld, Instructional Television, p. 34.

[3] Ibid., p. 31.

Financing for local programming

Though local control was an important selling point for ITFS, the concomitant necessity of long range financial commitment to local programming was often not considered in the original administrative decision. Frymire points out that, since ITFS is designed specifically for local service, "in the long run systems are not going to be able to produce good local service with imported materials. They are going to have to produce some local materials."[2] White reiterates this sentiment by asking the question:

> Why would you go to all the trouble of building and installing an ITFS system for your school if the only problem you had was acquisition of curriculum materials outside your own system. What you've said by installing it is: Our problems pertain so uniquely and directly to our school that we have to deal with them ourselves....

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[1] White, private interview.

[2] Frymire, private interview.

> Then how can you go and buy curriculum materials and apply them to your school?[1]

Cooper advised in 1967 that, although "local programming schould be undertaken only when you have the budget and personnel to produce high-quality materials," the "educator and administrator must bear in mind that a small studio beginning should be regarded as just that--a beginning. Many educators who have allotted only a limited and underbudgeted amount for the studio sometimes become dissatisfied once the low-cost system is operating."[2] The opposite problem, i.e. "overbudgeting for initial studio equipment and proceeding with a large, overdesigned installation, can lead to poor economical use of the system as a whole," but this problem did not afflict the very early users of ITFS.

Attitudes towards ITFS, reflected in administrative patterns, budgeting, and instructional application tend to bear out the opinion of Ray Graf of the New York State Department of Education that "many early systems failed not because they were 2500 MHz systems but because they were very expensive additive operations.[3]

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[1] White, private interview.

[2] Cooper, et al., p. 48.

[3] Graf, private interview.

ITFS as a Technical Entity

Engineering Design

Some of the problems of early ITFS systems are more directly related to the technical aspects of the medium itself. The essence of successful development of ITFS was careful engineering at both the local and the regional levels. ITFS presented a new concept of systems design, however, with which neither the educators nor the manufacturers representatives were familiar. Allen Pawlowski, senior systems engineer with Jerrold Electronics, described the unique design of ITFS:

> ITFS represents the first system concept which combines two separate engineering disciplines. The engineer responsible for designing an ITFS system must be familiar with the basic requirements of both wireless and wired communications systems. The requirement for each portion of ITFS systems are well established and draw upon a substantial historical background as old as commercial television broadcast itself.
>
> The wireless portion of an ITFS system utilizes techniques developed in the field of commercial broadcasting and point-to-point microwave....
>
> The wired portion of an ITFS system is similar to a regular coaxial cable master antenna television distribution system and distributes the new ITFS channel to all participating school classrooms.
>
> A critical point in the over-all design of an ITFS system is the interface between 2500 MHz broadcast and VHF cable distribution. This includes the 2500 MHz receiver/converter and the distribution system headend processing equipment. The selection of equipment at

> this critical point must take into consideration the peculiarities of each distribution method--microwave and cable.[1]

Part of the problem was that engineers who had experience with the principles of local systems of this type were in short supply.[2] Edward Galuska recalls that "few people knew what engineering had to be done. They guessed, or they put it in and said 'Let's see if it will work.'"[3] Broadcast principles did not apply to ITFS. Broadcast television, which could not employ the highly directional transmitting and receiving antennas essential to ITFS, relied on elevated antennas and powerful transmission, highly inefficient in contrast to the limited range and low cost demanded by ITFS.

Because there was no other source of information available to potential users, manufacturers' representatives, not familiar with the capabilities of the hardware or with the needs of education, were able to determine the design of many early ITFS systems, to make unsubstantiated claims of coverage, and unrealistic cost estimates. Weinberg warned administrators that "unfortunately, in a new media application such as 2500 megacycle television, many claims made by manufacturers are simply not valid."[1]

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[1] Allen Pawlowski, "Interfacing ITFS Broadcasting with School Cable Distribution Systems," (1967).

[2] Weinberg, "Microwave ETV," p. 22.

[3] Galuska, private interview.

Federal Funds

The incentive to manufacturers mushroomed with the prospect of federal funding, previously reserved for broadcast ETV. Amendments to the National Defense Education Act of 1958, incorporated in PL 88-665, provided matching funds for the support of critical subject areas. "Listed among the eligible equipment (was) the receiving portion of 2500 Mc systems (converter, antenna, coaxial cable), plus the distribution system and television receivers."[2] Support was also available for instructional television through the Vocational Education Act of 1963 and the Economic Opportunity Act of 1964. Above all, the liberal 89th Congress was expected to authorize major federal support for elementary-secondary as well as higher education. By early 1965, with the Elementary-Secondary Education Act and the Higher Education Act in congressional committee, the ITFS equipment business was, according to one electronics industry journal, "booming". The journal reported that

> Three microwave companies (Adler, Electronic Missiles and Communications and Micro-Link) are battling for

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[1] Weinberg, "Microwave ETV," p. 22.

[2] Litton Industries, Statement on Federal Aid for 2500 Mc ITV System (Mimeographed).

> supremacy in the lucrative instructional TV market. RCA is reportedly considering an entry via distribution of EMC's equipment..... Estimated total market is nearly 40,000 high schools and colleges.[1]

Recognizing the marketing potential, as well as the technical naievete of the educational administrators, manufacturing firms offered a complete package which relieved the educators of any responsibility for the design and development of an ITFS system which, in the end, was supposed to serve their own peculiar needs:

> To aid the school district in obtaining the best possible reception in all its schools, the Litton Educational Technology Division assumes full installation responsibilities. This includes:
>
> 1. A preliminary discussion, between local educators and ... experienced systems engineers, of the district's needs and resources in terms of teaching staff, number of students, and available dollars.
> 2. Complete detailed survey of the district by Litton engineers to relate these needs and resources to such variables as location of the transmitting and receiving antenna, geographic area, number of channels desired, and future expansion.
> 3. Selection and integration of the most advanced equipment, material and services to create a complete television system best suited to the district.
> 4. Preparation and follow-up of all FCC applications.
> 5. Training of operating personnel and maintenance of the system.[2]

Manufacturers prepared elaborate promotional materials, including information on application procedures, federal funding possibilities and cost estimates. Again Weinberg warned educational administrators against the loopholes in such literature:

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[1] Reprint from MicroWaves (February, 1965).

[2] Litton Industries promotional brochure, "A New Concept in Television for Education."

> Several of the large electronics industries have issued booklets which with cost estimates of 2500 megacycle systems. In considering a potential installer, it is advisable to employ an independent consultant with some experience in systems of this kind (unfortunately, they are in short supply).
>
> It is my opinion that general cost estimates do not reflect quality, reliability, and the specific details pertinent to a particular systems requirements. Although it is simple to price hardware, many other factors determine the total cost of a system. A competent consultant should, if he hasn't done so, visit on-going systems, supply comparative data and prepare careful specifications.... Inadequate specifications prepared for bidding can prove to be quite costly.[1]

Speaking from the point of view of the equipment manufacturer, George L. Lawrence argues the same fact:

> Specifications for ETV systems can only be detailed after the propagation path has been determined. Bidding on an unsurveyed system can be a dangerous gamble, since a proposing firm may not be fully aware of obstacles and/or electromagnetic interference which can attenuate signals. To cover itself against severe losses, the company must either overbid--which can lose it the contract--or conduct a careful optical and electromagnetic field survey to safeguard against these possibilities.[2]

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[1] Weinberg, "Microwave ETV," p. 21.

[2] George L. Lawrence, "Microwave ETV System Planning and Installation," Electronics World, LXXVII, No. 5 (May, 1967), p. 36.

Necessary considerations

Failure to consider all of the engineering requirements for clear and reliable reception caused disappointment on the part of some ITFS users with the technical performance of their systems. The first and major problem facing the ITFS systems designer must be to determine the optimum size of the receiving antenna. The primary criterion for the decision is the "noise figure of the distribution system.... Selection of receiving antenna size should be based on a desired signal-to-noise ratio output. This provides the basis upon which to determine the optimum receiving system."[1] Kessler explains the meaning of "noise" and the problems educators face in light of the "exaggerated claim for coverage or service range which is made by some overzealous proponents."[2]

> Television signals at any frequency--including ITFS frequencies under line-of-sight conditions--weaken in a gradual manner with distance, and the criterion of maximum service range or coverage is completely dependend on the quality of the displayed picture on the classroom receiver, defined as the minimum acceptable quality in terms of picture signal-to-noise (snow) ratio. Thus, the maximum service is dictated very largely by how snowy a picture we are willing to watch! Once the minimum signal-to-noise (or picture-to-snow) ratio has been realistic established, one finds that the maximum service range shrinks considerably.[3]

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[1] Pawlowski, n.p.

[2] Kessler, Technical Requirements, p. 3.

[3] Ibid., p. 3.

While these signal losses may be in part compensated by increased transmitter power and increased antenna gains, increased power limits the possibility of repeating channel assignments in adjoining areas, while the construction of antenna towers multiplies the cost of an ITFS system. Again, Kessler warns that:

> System designs by over-enthusiastic engineering planners frequently call for impractically large parabolic receiving antennas of 6 to 10 feet in diameter placed on the top of absurdly tall receiving antenna structures in order to overcome the inevitable earth-obstruction losses produced by earth curvature, tall trees, hills and buildings along the path between transmitting site and receiving sight.[1]
>
> It must be remembered that these things always cost money since the longer paths will generally require antennas of higher gain supported by taller towers. The deadline combination of large-diameter receiving antennas, which exhibit high wind-loading effects when supported by tall towers, really sky rockets the cost of each receiving installation....
>
> It should be recognized that ITFS systems ... are subject to the usual engineering "trade offs." That is, the maximum service range can be increased provided the designer or user is willing to sacrifice performance in terms of classroom "picture-to-snow" ratio, transmission reliability or economy!

A second important consideration in the design of an ITFS system must be the performance margin built into the system "to accommodate inevitable reductions in received signal strength due to varying meteorological/atmospheric conditions along paths longer than 10 miles."[1] In describing this margin, commonly referred to as "fade margin" Pawlowski states that

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[1] Ibid., p. 3.

[2] Ibid., p. 5.

> in order to maintain operating parameters, especially noise figure, it is best to maintain fixed operating gain within the transistorized receiver/converter. The output signal will therefore vary with each fade and must be subjected to some type of automatic gain control.[2]

The problem of guarding against fading was one frequently overlooked by the "fast sell" crowd in the early development of ITFS.[3]

A third consideration in ITFS reception must be reliability. Reliability of the ITFS transmitter affects every school utilizing the service. In addition, the problem of reliability of performance in each individual institution is an important consideration because

> unlike the transmitter location, where engineers and technicians are on duty and can make immediate repairs in case of failure, any failure at a receiving school must await the arrival of a technician. This could mean the loss of one or more days of ITFS programming.[4]

Problem of Saturation

More than inefficiencies in local reception and budget, however, poor engineering caused severe and unnecessary problems of spectrum saturation on a regional basis. In spite of FCC power limits and insistence upon careful engineering the early development of ITFS is marked by problems of interference and saturation. The Commission, in granting applications, checked technical feasibility, financing and legality of the application, but did not have any knowledge of the local situation of the applicant. Applications were processed on a first-come, first-served basis, without prior investigation of existing or potential licensees or of the possibility of interference or saturation.

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[1] Ibid., p. 5.

[2] Pawlowski, n.p.

[3] Kessler, Technical Requirements, p. 5.

[4] Pawlowski, n.p.

In some areas, at a very early date, the number of applications caused problems because of their quantity. On Long Island, for example, there was an imminent problem of saturation. By early 1965 some 57 school districts within a radius of 25 miles in Nassau County had, according to David McPherson of Varian Associationes, expressed interest in developing their own systems.[1] The entire state of New York was in danger of being saturated as interest grew and state support was available for construction of ITFS facilities. The New York problem was compounded by the fact that several major diocesan school systems, including New York City, Brooklyn and Rockville Center, had applied for ITFS licenses. Mr. Sam Saady, Chief of the Television Applications Branch of the FCC, expressed early concern about this irregular development:

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[1] Federal Communications Commission, Official Report of Proceedings of the National Committee for the Full Development of ITFS (Washington, D.C., February 8, 1965), p. 15.

> We have heard about Long Island ... and the situation up there. This will happen elsewhere, particularly in the large metropolitan areas. I suspect that once funds become available for 2500 megacycle service we will see an even added increase in applications and we have not the time nor sufficient information to give these applications the check that they really need.[1]

Lack of Growth

At the same time that some areas were facing such saturation worries, other parts of the country showed no growth of ITFS whatsoever. Dr. Hyman Goldin, FCC Assistant Chief of the Broadcast Bureau, and others attributed the slow development of ITFS to the fact that, within the educational community, "there was not sufficiently general knowledge about the potential of 2500 megacycle television."[2] By early 1965 both the Elementary-Secondary Education Act and the Higher Education Act were in Congressional committee; educational leaders had high hopes for their passage during the 89th Congress. In light of this anticipated major federal funding for ITFS, FCC staff and interested educational leaders were eager to disseminate information and to encourage development of 2500 MHz television. Many expressed concern that local administrators, more familiar with broadcast ETV, would overlook the possibilities of local distribution systems when and if funds were allocated.

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[1] Ibid., p. 95.

[2] Ibid.

National Committee for the Full Development of ITFS

In an effort to solve this dual problem of irregular growth and lack of general knowledge, the FCC called together several leaders of ITFS in February 1965. Staff members at the Commission and others foresaw the need for some sort of clearinghouse for information and planning, both to offer information to the Commission and to encourage the systematic development of new 2500 MHz systems. Dr. Robert Hilliard, who had replaced Frymire as Chief of the Educational Broadcast Branch, cited "the rapid growth of the Instructional Television Fixed Service.... (and) the potential and actual saturation of channels, uncoordinated planning, and the inefficient use of channels" as the major problems faced by the FCC and education in general with regard to ITFS. These pressures "suggested the need to establish national and regional groups of educators to assist in the most efficient development of ITFS."[1]

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[1] U.S. Congress, Senate, Committee on Congress, The Public Television Act of 1967, Hearings before a subcommittee of the Committee on Ways and Means, Senate, on S.1160, 90th Congress, 1st sess., 1951, p. 494.

The result of the February 1965 meeting of educators was a recommendation for the establishment of a national committee to work for the development of ITFS. Those present, many of whom indicated a desire to serve on such a committee, envisioned a network of regional, state and local subcommittees, appointed to "achieve the effective utilization of ITFS channels and to provide information both to the Commission and to education at large on the development of ITFS."[1]

Accordingly, the Commission announced on October 6, 1965, the establishment of a National Committee for the Full Development of ITFS. Commissioner Robert E. Lee was designated as permanent chairman of the Committee which was "composed wholly of representatives of State and local agencies, and educational, charitable, religious, civic, social welfare and other similar non-profit organizations."[2] Membership in the National Committee would be drawn from five divisions operating under the Committee: four regional divisions encompassing the northeast, south, midwest, and far west, and one division representing national organizations. The Committee was further authorized to invite industry representatives to attend its meetings. This Committee was strictly advisory to the FCC with no regulatory power or legal force in itself.[1]

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[1] "FCC establishes Committee for Full Development of Instructional Television Fixed Service," Public Notice FCC 65-907, adopted October 6, 1965.

[2] Ibid.

The first meeting of the Committee for the Full Development of ITFS was scheduled for November 5, 1965 at FCC headquarters in Washington, D.C. The agenda for this first meeting included discussion of expansion of the National Committee and the regional divisions, the division of State and local groups, reports to the Commission, future meetings of the Committee and the informational and coordinating objectives of the Committee.[2] Representatives to the November meeting worked mainly on determining the role and focus of the new group and the establishment of specific objectives to guide the Committee's activities: The following specific objectives for the Committee were adopted:

A. To foster the wider and more effective use of frequencies in the 2500 Megacycle band for in-school instruction and administration and special education by bona fide educational organizations.
B. To provide procedures and guidance so as to insure facilities to all qualified applicants on a non-discriminatory basis consistent with the obligation of conserving frequencies for future uses where needs are not now readily apparent.
C. To maintain liaison with and to provide information to educators and educational institutions and organizations throughout the country on the state of the art, on actions by the Commission, and on the rules and regulations governing ITFS.
D. To maintain continuous liaison with the Commission

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[1] _Ibid._

[2] _Ibid._

> and to keep it informed on the problems, needs, developments, and plans for ITFS throughout the country.[1]

Those attending the November meeting agreed on a regional and local structure of subcommittees and set January 1, 1966, as a deadline for establishing these substructures.

Channel Limitation

As an immediate result of recommendations by the Committee, the FCC issued on February 14, 1966, a Notice of Proposed Rule Making, proposing 1) to amend the Commission's rules to limit each applicant to no more than four channels in any one area for ITFS frequencies, 2) to require that applicants apply for no more channels than they intended to use promptly, and 3) to amend the prescribed application form (330-P) to require applicants to attach maps of the boundaries of the school districts to be served and contiguous school districts.[2]

When the limitation of five channels for one applicant was set in 1963 the FCC was acting in the dark, with no field tests of ITFS and no knowledge of the uses to which the new system would be put. The Commission established the arbitrary limit of five on a temporary basis "until we are able to make a more accurate estimate of the potential demand for channels and have gained experience in the effectiveness of geometric arrangements of assignments."[1]

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[1] Federal Communications Commission, Official Report of Proceedings of the National Committee for the Full Development of ITFS (Washington, D.C., November 5, 1965), pp. 7-8.

[2] Notice of Proposed Rule Making, Docket No. 16453, FCC 66-130, adopted February 14, 1966.

In 1966 the Commission and most members of the Committee agreed that the provision of a fifth channel was not warranted. In the first place, licensees had not shown a need for this fifth channel. Of equal importance, the assignment of the fifth channel in a second group, in addition to the four reserved for the applicant in the first group, tended to make the second group less useable by other applicants in the surrounding area.[2]

Although some groups testifying recommended modifications, the proposed limitation to four channels by the Commission met with no objection. To reassure any parties who feared four channels would not serve their purposes, the Commission reiterated an earlier statement that careful consideration would be given to requests for waiver of the four-channel limitation, "most especially in areas where there is little likelihood of ITFS saturation in the foreseeable future."[3] In its Report and Order on Docket 16453 the Commission ruled that

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[1] Report and Order, *Docket No. 16543*, FCC 66-608, adopted July 13, 1966, p. 7.

[2] Notice of Proposed Rule Making, *Docket No. 16543*, p. 3.

[3] Notice of rule making, p. 3.

> If an applicant will serve more than one school system and it becomes apparent that more than four channels will be required to effectuate the system proposed, a request for waiver should be filed. Every consideration will be given to such a request in the light of the special circumstances surrounding it.[1]

Previously, no limitation had been set on the length of time an applicant would be given to implement the plans set forth in his original application. The FCC provided that an applicant proposing operation of fewer than four transmitters at a single location might request that the remaining channels in the group be reserved for future expansion of the system and that the Commission would try to avoid assigning the remaining channels in the group as long as such action appeared feasible in the judgment of the Commission. Since the provision did not give some applicants sufficient assurance, many systems applied for four channels without definite plans for their use. The proposal in Docket 16543 sought to remedy this unnecessary hoarding of channels.

Opponents of this amendment argued that it would "discourage the development of an ITV educational system since the utilization of ITV channels and the fiscal realities of educational institutions are necessarily predicated on long-range planning....The fact that the use of all channels in a multiple-channel system cannot be inaugurated immediately should not preclude an applicant from obtaining an authorization for those additional channels which form an integral part of a plan for the use of ITV."[1] ITFS, they maintained,

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[1] Report and Order, Docket No. 16543, p. 2.

> was established to make available to education a multiple-channel system so that teaching material in several subjects could be transmitted simultaneously.... The availability of all four channels was as essential to the development of the system as is the availability of the first....The true economies of ITV lie in its use on a multiple-channel basis.[2]

The Commission concurred with this line of reasoning, but maintained that, since ITFS assignments were already becoming scarce in some sections of the country, unused authorizations "should not be allowed to lie fallow but should either be activated within a reasonable length of time or released to allow reassignment of the channels to applicants who are able and willing to construct and operate on them."[3] Therefore, the ruling was not amended, but the Commission's rules were revised to require that applicants applying for more than one ITFS channel submit to the Commission a plan indicating when they intended to begin and complete construction on each channel for which they applied. The Commission's Report and Order stated that "the Commission will examine the proposal and, in the light of the circumstances surrounding the application, will determine whether or not a grant of the channels applied for would serve the public interest."[1]

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[1] Ibid., p. 3.

[2] Ibid., p. 3.

[3] Ibid., p. 3.

With regard to the attachment of a map to the Form 330-P, the FCC did amend its rules to require such an appendix. The complete Form 330-P, including attached maps, would be forwarded by the Commission to members of the Committee for the Full Development of ITFS so that regional and local planning could be based on factual data supplied by the applicants themselves.[2]

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[1] Report and Order, p. 3

[2] See Appendix for application procedure and Form 330-P.

Chapter IV

Inter-Institutional Cooperation in the Development of ITFS Systems

During its early development Instructional Television Fixed Service was characterized as an economical, locally-controlled system oriented to the traditional public school organization structure and needs. Many of the first systems to apply for construction permits reflected this basic design. The 1967 study of CCTV and ITFS television systems concluded that "only relatively few systems have matured into high quality versatile installations with technical standards comparable to those of broadcast television."[1] Advanced engineering design, increased experience with and dissemination of information about ITFS, restructured organization patterns, extensive federal funding and pressures on other segments of the educational community subsequently reversed this early trend.

Development of diocesan ITFS systems

Public school systems, hampered by lack of leadership, information and, above all, by cumbersome administrative machinery, moved slowly in the development of ITFS systems. By contract, and for a variety of reasons, the Roman Catholic diocesan school systems moved with decision, force and major financial support. The parochial schools, severely pressured by overcrowding, staff and curriculum changes, and spiraling costs of education, recognized an urgent and real educational need. Some of these problems--the necessity of teacher retraining, pre-service teacher training and "virtually revolutionary" curriculum changes"--were common to all school systems.[1] While federal aid was available to public school systems, particularly through National Defense Education Act institutes, for the retraining of teachers in critical curriculum areas, the parochial school personnel received no subsidy for training. Further, parochial schools were not eligible for many of the facilities improvements authorized in federal legislation. The Catholic school systems were hard-pressed to meet accrediting standards for programs in the laboratory sciences, to hire special music, art and foreign language teachers and to build expensive facilities.[2]

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[1] DAVI, CCTV Survey, 1967, p. 3.

Diocesan school systems also faced massive problems related to their size. Reverend Michael Dempsey, Assistant Superintendent of the Brooklyn Archdiocesan school system, which includes 6000 teachers and 240,000 students, considers this one of the major justifications for the use of television.

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[1] Dempsey, "The Promise of Microwave ETV," p. 21.

[2] Ibid., p. 21.

> The many obstacles to universal good education, particularly in a large school system, resolve themselves into a question of adequate distribution of resources or, better still, a question of communications. Bigness tends to compartmentalize functions, to isolate groups of people or teachers or schools....
>
> A mass communications medium ... offers the possibility of breaking the logjam of communication, particularly if it can be tailed to the real needs of the school system so it serves education without dominating it.[1]

ITFS, as developed by the diocesan school systems, was "geared to provide those elements of education that are over and above the ordinary capabilities of the classroom."[2] ITFS offered an opportunity to upgrade the quality of instruction throughout a whole system without having to provide more facilities or more faculties.[3]

The local control of the system inherent in ITFS offered unique benefits for diocesan administrators as well. By owning the total system Catholic educators and administrators could "exercise greater freedom in program content (including the teaching of religion) with fewer legal restrictions or equal-time requirements."[4]

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[1] _Ibid._, p. 21.

[2] _Ibid._, p. 21.

[3] Frymire, private interview.

[4] Dempsey, "Promise of Microwave ETV," p. 22.

The diocesan organization structure also allowed for a systematic development of ITFS within this sector. A single person, the bishop, was responsible for the school system, for out-of-school religious education, for the basic administrative framework of the total diocesan organizational unit. This facilitated a systematic approach to ITFS as an instructional and administrative tool for in-school and out-of-school application. The fact that the bishop was also responsible for the financial activities of his diocese made it possible for him to act decisively to appropriate substantial funds for television. While public school systems were dependent upon deliberative school boards and, in many cases, an expression of public support by passage of a bond issue, the administrator of the diocese was a much freer agent. When the Catholic schools and other elements of the dioceses could prove an urgent need, the administrator could act. Since the bishop was also responsible for personnel appointments, he could also provide the staff to support a major television facility.

A major problem of the dioceses was that of religious training of Catholic students turned away from overcrowded Catholic schools. In order to supplement the religious training of these students attending public schools the Roman Catholic bishops charged the Confraternity of Christian Doctrine with the responsibility for the development of a comprehensive religious instruction program. Special teachers were needed but in short supply; expensive training materials were not available. The locally controlled ITFS system, free to supply religious training on a broad scale, eased the problem of teacher education and of direct instruction of CCD students. Monsignor Joseph H. O'Shea, head of the Miami (Florida) diocesan Radio and Television Commission, described the situation in 1967:

> The major obstruction that impedes the success of the CCD program is the problem of teachers. For one thing, there is a tremendous shortage of teachers in relation to the masses of Catholic children that should be part of the program. For another, it is extremely difficult to train properly those good people who have volunteered to teach.... The result is that, ... the classes lack sparkle, the students lose interest, and after a short time, they either stop attending or are present only under great duress.... It is one thing to look for dynamic class presentations by volunteer catechists, who are immersed in a multitude of secular pursuits and responsibilities, and, almost always, have little time for class preparation. It is something else again, to bring into the classrooms a model lesson presented by an outstanding teaching talent, and then to ask the catechist to "follow up" the lesson with appropriate discussion techniques.[1]

A similar problem facing Catholic educators was that of students attending secular colleges and universities. Responsibility for the religious training of these students rested with the National Newman Apostolate which assigned chaplains and staff members to serve Catholic students on individual campuses. Again, Monsignor O'Shea described the problem and the solution offered to ITV:

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[1] Monsignor Joseph H. O'Shea, "Interdiocesan Television: Programming for Quality," report of the initial meeting of the Interdiocesan Television Association, Fort Lauderdale, Florida, February, 1967, pp. 8-9. (Mimeographed.)

> The rapidly increasing number of community colleges present special complications. The students are day-hops, who generally have neither time nor inclination to stay around campus when their classes are finished. To try to present a Newman program that will attract any notable number of these students, is almost an impossible task.
>
> Obviously, the chaplain cannot give a philosophical or theological presentation every hour on the hour, in order to exercise this part of his apostolate on various groups of students during their free periods. Such "live" presentations would be a physical impossibility.
>
> But dynamic, relevant presentations could be available every hour on the hour through combined ... programming and, either the multi-channel diocesan TV system or ... an inexpensive videotape recorder.[1]

Furthermore, because ITFS could be used for administrative traffic, the bishop could use an existing system for a communication link between the diocesan administration, religious communities, priests' councils and other diocesan units. William J. Halligan, Educational Consultant for Micro-Link Varian Associates, stressed the element of privacy of ITFS as being "of special interest for parochial school districts."

> The system can be used for religious instruction as well as for conferences of an ecclesiastical nature. For example the bishop might use it to address all the priests or pastors of his diocese or the faculties of

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[1] *Ibid.*, p. 10.

> his schools. He, the superintendent of schools or some other person can address all the students and faculties at one time.[1]

Diocesan administrators foresaw other applications of ITFS in Catholic hospitals, non-Catholic adult education, Catholic youth groups, missions and other church activities organized on a diocesan level. Because of this systems approach, made possible by the organization structure of the diocese, ITFS was "deliberately planned to be an instrument for the whole instructional and educational apostolate of the Church."[2] The approach, according to Monsignor Ralph Schmit, Director of Television for the Milwaukee (Wis.) Archdiocese, reflects the thrust of Vatican II, that of "communicating with the world and giving Christian witness."[3]

The concept of instructional television was not new to Catholic educators. Several Catholic school systems had experimented with the use of instructional television since its earliest inception, participating actively in community public broadcasting projects both as teaching staff and by offering entire courses within their schools over broadcast or CCTV. Catholic schools were full supporters of the

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[1] Quoted in Perrin, n.p.

[2] Dempsey, "Promise of Microwave ETV," p. 22.

[3] Monsignor Ralph Schmit, private interview held in Wilwaukee, Wisconsin, August 19, 1969.

Chicago Area ETV organization and had actively participated in the Midwest Program for Airborne Television Instruction (MPATI).[1] A 1960 report on activities of Catholic educators in instructional television indicated, for example, that

> The Catholic schools of Pittsburgh are taking a prominent part in the in-school (television) programs. There are 1,123 classrooms in the diocese which are currently using television for basic instruction in science, in physics and in developmental reading.... Teachers ... are taking in-service work in developmental reading. Teachers from the diocesan schools have taught in-school programs over these stations. Diocesan elementary and secondary schools in Boston, New Orleans, St. Louis, and Raleigh are also using television for direct teaching.[2]
>
> Several Catholic schools are currently using closed-circuit television for at least part of their regular instruction. On the college level this number includes Dayton, Detroit, Duquesne, Fordham, Georgetown, Loyola of Chicago, Marquette, and Notre Dame. De La Salle High School and Ursuline Academy of Dallas use CCTV for high school subjects.[3]

This report listed numerous local activities by Catholic educators in the field of instructional television. Such experience with television as a medium had demonstrated to some Catholic educators such as Father Dempsey that

> TV operates in its own peculiar way ... so we must accommodate outselves and our materials to its demands as a medium. If it is used at all, it must be allowed to operate effectively both as television and as education. In our enthusiasm for a new, promising medium,

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[1] Frymire, private interview.

[2] Culkin, "Television in the Service of Education," p. 33.

[3] Ibid., p. 36.

> we must insist on good education and bend the medium to do a worthwhile educational job.[1]

Above all, the leadership of one man, Reverend John M. Culkin, S.J., was responsible for the development of ITFS on the diocesan school system level. It was Culkin who "stimulated dioceses to take a giant step into the age of electronic education."[2] A long-time advocate of instructional television, Culkin warned his fellow Catholic educators that

> Leadership will fall only to those who share the responsibilities of the pioneer stages. It is possible to be "too late," and some schools will find that they have unwittingly built themselves into an electronic ghetto where they meet with groups of fifty or one hundred, while others are reaching for thousands. In an enterprise of such moment for education, we can afford to have no bystanders in the ranks of Catholic education. Educational television will be as effective as its leaders. If not us, who? If not now, when?[3]

When ITFS was considered by the ITFS, Culkin assumed the rule of leadership in informing Catholic educators of the potential of instructional television in general and ITFS in particular, of advising local administrators and guiding the development of several diocesan ITFS projects. "If Catholic education has been somewhat slow to take full advantage of educational television," he told his colleagues,

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[1] Dempsey, "Promise of Microwave ETV," p. 22.

[2] O'Shea, p. 1.

[3] Culkin, "Television in the Service of Education," p. 24.

"it is not too late to head off the movement at the pass."[1] ITFS offered Catholic education the opportunity it needed for action. In his position as educational television consultant to the National Catholic Education Association, Culkin assumed the role of herald of ITFS. Operating on the expressed theory "that tomorrow is that period of time which is 24 hours away from today."[2] Culkin responded immediately and dynamically to the authorization of ITFS. During the first years of ITFS he spoke widely at Catholic education conferences, biships' meetings, religious communities and with individual administrators, extolling the opportunity presented to Catholic education by ITFS.

Culkin was able to provide the advice and expertise that was lacking in the public school domain where no organization had assumed such a leadership role. In meetings with diocesan representatives he discussed the technical aspects of 2500 MHz television, including "transmitter quality, vendor reliability, capable consultantative help, and finances."[3] Of utmost importance in considering the hardware for ITFS and its installation, he warned potential users, were "a good consulting engineer and alert legal counsel."[1] He advocated limited local programming at the outset because "lack of necessary time, knowledgeable personnel and suitable resources" produce programs of less than desired quality. In general Culkin outlined for those contemplating the use of ITFS a policy of "slow-fast-slow" which meant that "persons involved for the first time in 2500 megacycle television need to be slowed down early in the game until it is obvious that they know what they are doing, then speeded up to keep them interested and involved, and finally slowed down again to make sure they are telling the public all the facts--advantages and limitations of the medium rather than overenthusiastic, distorted views of ITFS."[2]

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[1] Culkin, "ETV (and Catholic Education) Zoom In or Fade Out," America, CVI (November 11, 1961), p. 174.

[2] Ibid.

[3] O'Shea, p. 1.

Culkin's leadership and diligence influenced many of the nation's largest dioceses to apply for reservations for ITFS channels. Not all of these systems have subsequently activated their channels, but at one point Catholic systems held 74 of a total of 84 channel reservations in the country with four Catholic school systems holding a total of 61 channels in several metropolitan areas.[3]

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[1] "ITFS (2500 Mc/s)," Audiovisual Instruction, XI (June-July, 1966), p. 444.

[2] Ibid.

[3] Donald F. Mikes, "The Development of the Instructional Television Fixed Service (unpublished paper, University of Maryland, April 22, 1969), p. 21.

Bradley demonstration

Inherent in the original Rule Making establishing ITFS and in the plans for diocesan school systems was the concept of a multi-channel extended range facility. The first demonstration of the practical utility of low power, extended range, multi-channel transmission via ITFS was conducted in January 1965 by Bradley University in Peoria, Illinois. At this demonstration for "over 100 school administrators, superintendents and teachers," an omnidirectional signal in color was broadcast in Peoria and received at a school fifteen miles distant in Morton, Illinois.[1] From an engineering standpoint the Bradley system demonstrated the technical feasibility of extending the range of ITFS beyond the geographic bounds of the local school system. To demonstrate this capability, Dr. Philip Weinberg, Director of the ITFS system and Head of the Electronical Engineering Department at Bradley, employed new engineering techniques and prototypes of specially designed 2500 MHz equipment. "If you added up all the serial numbers of all the component parts of the system," Weinberg recalls, "they would have added up to less than 100."

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[1] Weinberg, "Microwave ETV," p. 21.

[2] Philip A. Weinberg, private interview held in Peoria, Illinois, August 20, 1969.

Federal funding for ITFS

The technical potential of ITFS became an economic possibility with the passage of major federal legislation in support of education. The maturity of the engineering design and of carefully conceived plans coincided with the federal program of assistance for technology which reached its peak with passage of the Elementary-Secondary Education Act and the Higher Education Acts in 1965.[1] Technology and available funding "meshed together so that we find the federal government not only made the frequencies available through the FCC but also, through the actions of HEW, brought into being a substantial number of the total ITFS systems now in operation."[2]

The ESEA (Public Law 89-10), authorized in April 1965, did not mention ITFS specifically; funding for instructional television facilities was authorized under Title II which supported Supplementary and Education Centers and Services. Several school systems were also eligible for funding for ITFS development under Title I of ESEA which provided Financial Assistance to Local Educational Agencies for the Education of Low-Income Families. Major funding for the development of instructional television facilities was also available under the Higher Education Act of 1965, specifically Title I, for Construction of Graduate Academic Facilities and Title VI, Financial Assistance of the Improvement of Undergraduate Instruction. Some ITFS systems were also developed with federal funds under the Nursing Education Act.

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[1] Frymire, private interview.

[2] Ibid.

In order to encourage development of ITFS systems under federal assistance programs the Committee for the Full Development of ITFS undertook a campaign to disseminate information about the nature of ITFS and techniques for establishing local systems. The major effort at information dissemination was the publication of an ITFS brochure sponsored by the Education Industries Association, the National Association of Educational Broadcasters, the FCC and the New York State Department of Education. The booklet, edited by Dr. Bernarr Cooper of New York State, Dr. Robert Hilliard of the Commission and Dr. Harold Wigren of the Department of Audiovisual Instruction, NEA, entitled ITFS: What It Is ... How to Plan", was published in 1967 by the NEA. Through the efforts of the Committee, 15,000 copies of the booklet were distributed to potential users of 2500 MHz television.

Development of college and university ITFS systems

Unparalleled pressures of enrollment, changing curriculum demands and new services, combined with passage of the federal legislation in support of instructional television, spurred the development of major ITFS systems at the higher education level. These systems frequently represent new organization patterns and, to a large extent, have included advanced engineering techniques in their original design.

In many ways, the development of ITFS at the higher education level is analogous to its development within the diocesan school systems. In the first place, colleges and universities had experience with the medium of television, particularly with closed circuit television. The 1962 survey of CCTV facilities indicated that:

> The most rapid growth of closed-circuit television has been in the institutions of higher learning. There is evidence to support the fact that higher education, due to pressing enrollment problems and the shortage of highly skilled instructors, will continue to expand its use of CCTV.[1]

As early as 1962, however, planners considered the problem of off-campus television distribution. The New York State Plan for the development of instructional television cautioned

> that consideration be given to the practicality of inter-connection of campus television production centers with educational television broadcast stations and/or with other campus television centers if such would prove educationally desirable. With proper television recording equipment, or transmitter interconnection, some of the campus television units could develop

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[1] DAVI, CCTV Survey, 1962, p. 76.

into production centers for remote education television stations or for distribution around the network.[1]

Secondly, the need for new methods of instruction at the college and university levels was urgent. Traditional methods are inadequate to meet the demands presented by unprecedented numbers of students; multi-campus institutions bring problems of administrative and instructional communication; faculty and resources cannot keep pace with radical curriculum changes and the current information explosion; institutions are called upon to produce unparalleled numbers of professional personnel for education, medicine and industry, to re-train personnel for these professions, and to continue the education of those in the professions. Instructional television presents one method available to significantly increase the range of existing resources at a minimum increase in cost. The catalog of the Association for Continuing Education at Stanford University describes the problems which necessitated the development of the ITFS system at Stanford:

> Tremendous student population growth ... combined with the rapid obsolescence of skills resulting from the ever-expanding body of knowledge in both technical and administrative fields of modern business and industry has created a crisis in education. One solution to the problem is through utilization of modern, well-managed communication techniques. Specifically, closed circuit television will provide the opportunity to bring more and more student/employees into a direct teaching

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[1] Quoted in CCTV Survey, 1962, pp. 76-77.

> relationship with the best educators available, while doing so at moderate cost. This objective is to be achieved through unification of available educational resources, while at the same time centralizing the requirements of participating local industry.[1]

In describing this utilization of closed-circuit television, including ITFS, the 1967 survey of CCTV/ITFS systems observes that

> The use of television in certain situations to increase the range of "normal" classroom instruction is a legitimate use of the medium. CCTV has helped many institutions meet the problems caused by rapidly increasing enrollments and the continuing shortage of qualified instructors.[2]

This same study continues, however, observing that

> In many institutions of higher learning such use, after long years of supplementary uses of the medium, has finally brought CCTV to economical stability and made possible continuation of more esoteric uses and experimentation with ways of improving instruction.[3]

This fact is significant, for many of the innovative developments in the use of instructional television, including ITFS, have been introduced by the engineering departments, or departments of radio and television, at colleges and universities. The operation of the Bradley University ITFS facility by the Department of Electrical Engineering provides one example, while the extensive continuing education program operated by Stanford University represents a unique application of instructional television in the "first really substantial attempt to cut down the need to move students and to bring lessons to the students."[1]

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[1] Association for Continuing Education, Catalog, 1969, n.p.

[2] DAVI, CCTV Survey, 1967, p. 2.

[3] Ibid., p. 3.

Institutions of higher education, particularly private colleges and universities, enjoy the independence necessary to make the major commitment in terms of financial investment and staff required for effective development of an instructional television system. Because of this administrative independence, complemented by a variety of programs for federal funding available to institutions for cooperative programs, for training in special professional areas and for experimentation, ITFS systems at the higher education level offer the greatest promise for future quantitative growth and development.[2]

Cooperation Among Institutions and Systems in the Development of ITFS

Public school systems

The practical necessity and engineering feasibility of extending the range of ITFS frequently demanded new organizational patterns within school administrations in order to transcend traditional geographic boundaries. The Bradley system is unique in this respect as well: the ITFS system operated by Bradley serves not the University but the school systems in the surrounding communities.

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[1] Frymire, private interview.

[2] Cooper, private interview.

Historically, the system was conceived by the Illinois Valley Educational Television Association, formed in 1964 to represent area school districts, parochial schools, local hospitals and industry.[1] In the fall of 1964 the Board of the IVETA requested Bradley University to develop a multi-channel television service available to area school systems on a fee basis. Having demonstrated the technical feasibility of ITFS as one aspect of a total regional television network, the Bradley system, in September 1965, began broadcasting educational programming to over 8,000 students in 22 parochial and public schools in five separate rural and urban communities.[2]

Though Bradley first demonstrated the engineering design necessary for a broad-based ITFS system, several other communities had also developed the type of organizational structure necessary for cooperative development of an ITFS system. An early example of regional cooperation is the New Trier (Illinois) Township Instructional Television

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[1] Weinberg, "Multi-channel Microwave," 22.

[2] Weinberg, "Microwave ETV," 23.

Council. As early as 1961 the New Trier High School and six feeder elementary school districts considered television as an answer to problems of communication and duplication of effort among the seven separate school districts, each with its own Board of Education and Superintendent of Schools. The goal of the Council was "to provide for all seven districts those things that they could do better in common than on their own, for the high school to take the lead in some areas, and to provide more resources to students."[1] In 1965 the New Trier High School applied for an ITFS construction permit in the name of the Council.

Another example of an existing cooperative program which looked to ITFS was the Midwest Program for Airborne Television Instruction (MPATI). MPATI was a non-profit educational organization whose corporate members represented public, private and parochial schools in a six-state region consisting of Indiana, Illinois, Kentucky, Michigan, Ohio and Wisconsin. The organization was formed "to provide every city, village or crossroads school with access by means of television to a wide range of quality instructional material at a small cost."[2] To achieve this goal, MPATI, operating on an experimental license, began in 1961 broadcasting instructional programming from a DC-6 aircraft hovering at 22,000 feet in the area of Montpelier, Indiana. In October 1963 MPATI applied for regular status for the use of frequencies in the upper UHF band.

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[1] Robert W. Pirsein, private interview in Winnetka, Illinois, August 18, 1969.

[2] Federal Communications Commission, Docket No. 15201, FCC 65-588, adopted June 30, 1965, p. 2.

The FCC in its Report and Order on Docket 15201, denied MPATI's request for UHF channels, adding that "the Commission will entertain an application from Midwest Program for Airborne Television Instruction, Inc. for six-channel operation in the 2500-2690 Mc/s band."[1] In March 1966 the Commission waived the limit of five channels per licensee to authorize construction permits for six ITFS channels to MPATI.[2]

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[1] *Ibid*., p. 4.

[2] Potential users of ITFS within the region served by MPATI expressed concern over the possible preemption of ITFS ground frequencies by air-borne ITFS distribution. In Cleveland, particularly, concern over MPATI's plans was one of the factors in the subsequent freeze on ITFS applications. In fact, the concern was not entirely warranted, since the same principles of directed antenna applicable to ground-based ITFS were inherent in air-borne distribution. McIvor Parker explained the principles to the Committee for the Full Development of ITFS: "If you have the receiving ends of the system looking away from the aircraft, then they would not suffer interference from the airborne operation, and if you have the ground-based receivers for reception looking away from the aircraft, again you get some continuation and again they could operate on the same channel without interference." [Federal Communications Commission, *Official Report of Proceedings of the National Committee for the Full Development of ITFS* (Washington, D.C., March 15, 1966), p. 87.] The entire questions was moot, however, for

Local cooperation to obtain federal funding

Local cooperative efforts took on new significance as public school systems made plans to apply for federal funding. In the Peoria area, for example, Weinberg reported that:

> In the fall of 1966 ... 29 communities will be participating (in the ITFS system). The principal additions were two rural counties ... with more than 40 schools. ... The rural additions were made possible because of the cooperative actions, on a county-wide basis, of the school boards and administrators in pooling their allotments under Title I of the Elementary-Secondary Education Act. Some of the school districts had such small individual allotments it seemed hardly worth the effort to develop a program to satisfy the requirements imposed by the state and federal agencies. Under the leadership of the county school superintendents, joint proposals were developed. Although a sizable portion of the initial allotments were used for hardware, the establishment of such a communications link has created unlimited utilization opportunities.[1]

Harold L. Coles, Superintendent of Schools in Fresno County (California) described a similar cooperative effort among his schools:

> The unique and urgent needs of culturally and economically disadvantages pupils in Fresno County was the single most important reason for the immediate provision of 2500 MHz system....One fourth of the 116,328 pupils enrolled in the school systems of Fresno County represent families of low income. In order to provide special educational opportunity for disadvantaged pupils through ITV, the Fresno County Superintendent of Schools authorized members of his staff to prepare a project application under the Elementary and Secondary Education

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MPATI later dismissed is construction permits and the DC-6 has since been grounded.

[1] Weinberg, "Microwave ETV, 21.

> Act, Title I, for the cooperative use of unused or unallocated funds on behalf of the school districts of Fresno County. Each school district Board of Trustees authorized such action by a duly adopted resolution. This application was approved by the State Board of Education....Each district transferred its funds by warrant to the applicant district which, in turn, transferred said monies to the County Superintendent for official expenditures.[1]

This type of cooperative planning for the development of ITFS systems was repeated in numerous other areas. Statewide telecommunications programs and programs for the expenditure of federal funds have done much to foster and to coordinate this type of cooperative venture.

College and university systems

Inter-institutional cooperation in the development of ITFS systems at the higher education level is, to a large extent, the reason for the relative success of the systems at this level. The variety of organizational patterns are not easily categorized, therefore, a brief description of various individual cooperative efforts provides a more comprehensive picture of developments:

A. Stanford University Association for Continuing Education. The Engineering Department of Stanford University in Palo Alto, California began work in 1954 to develop a program in continuing education by which the engineering department made available graduate level courses to part-time students who worked for local industry. The fact that students in the continuing education program were required to meet the regular class schedules on campus presented problems, however: courses were frequently taken because they were scheduled in convenient time periods; students were forced to commute long distances and in busy rush hour traffic; businessmen, frequently called out of town on business, were unable to make up missed class work; the fact that enrollment in the program was limited to degree-seeking candidates was not in the spirit of continuing education.

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[1] Harold L. Coles, Superintendent of Schools, Fresno County, California, Public Schools, Report on ITFS program (Mimeographed).

In 1967 Joseph Pettit was appointed by Dr. Donald Grace, Associate Dean of the School of Engineering, to investigate, plan and install an ITFS system designed to eliminate existing problems by carrying the courses, via television, to the actual industrial locations. The program developed by the School of Engineering has, since its inception, expanded to incorporate other disciplines and other institutions:

> Quite early in the organizational procedures, industry identified areas of instruction, other than graduate engineering, that it wished to make available to its employees. At the same time, participating institutions other than Stanford, also identified course work they wished to offer to on-campus enrollees as a partial or complete study experience. Accordingly the following

method was worked out:

1. An additional structure known as the Association for Continuing Education was organized with a board of ten representing the various industries and one representative from Stanford;
2. This non-profit educational group has its own executive head who organizes and causes the non-graduate engineering courses to be videotaped or offered "live".
3. The times of broadcast on the Instructional Television Fixed Service system are those which are not used by Stanford University for its own graduate offerings.
4. The offerings are for credit or non-credit depending upon the institution through which the student enrolls.
5. The Association for Continuing Education is valuable in that it frees Stanford University of the responsibility for the level of academic excellence of the non-Stanford courses.[1]

At present, San Jose State and the University of Santa Clara are in the process of preparing courses to be offered by ACE. The ACE Business Management Institute will offer certificates in several areas while Stanford will continue to offer graduate engineering courses and non-credit courses in engineering and such interdisciplinary courses as mathematics.

> Each participating industry agrees to meet certain minimum specifications in establishing its receiving site and monitoring classroom....Each participating industry makes a one-time-only contribution in capitalization support of the multi-channel network based on its annual gross sales. The contribution is used to acquire origination and transmission facilities at Stanford and to establish a fund to enable the University to continue to maintain and improve the technical facility....Operation of the Continuing Education Project is financed by

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[1] Bernarr Cooper and William J. Halligan, "ESEA Title V: Professional Improvement," project report by the New York State Department of Education, Division of Educational Communications, Bureau of Mass Communications, 1969. (Mimeographed.)

> a matching per credit tuition to industry of $45.00 and a supplemental television charge of $20.00 per credit hour, paid by each participating student.[1]

One unique feature of the ACE system is that all lectures are presented live.

> Both Stanford and individual companies have the right to make tapes of the lectures, but none will be rebroadcast. Stanford's tapes may be used by professors in self-evaluation of their teaching methods and, perhaps, for student make-up work. Companies' tapes may be used for make-up and review work; they must, however, erase their tapes at the conclusion of each term to protect the professors' copyright privileges.[2]

A second important feature of the ACE system is a two-way FM radio which links the instructor and each of his students.

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> Any student, whether he is in the studio classroom face-to-face with the instructor or in the classroom "just down the hall" from his working office, can merely reach for his microphone and ask questions or seek clarification whenever he so desires. His question as well as the instructor's answer are simultaneously heard by each student in each classroom regardless of location. The free exchange of communications between student and instructor so vital to the learning process is thereby maintained.[3]

The technical aspects of the response system developed by Stanford, and the possible development of this system for both voice and data transmission, have taken on added significance with the 1969 regularization of the service previously operated by Stanford on an experimental basis.

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[1] Ibid., p. 5.

[2] "New Television Facilities Help Teach Off-Campus Engineers," Stanford Engineering News, LXVIII (May 1969), n.p.

[3] Association for Continuing Education, Descriptive brochure.

B. The Association for Graduate Education and Research of North Texas (TAGER). TAGER was chartered in August 1965 by seven private universities and colleges of Northern Texas: Southwest Center for Advanced Studies of the University of Texas at Dallas, Southern Methodist University, Texas Christian University, Austin College, Bishop College, Texas Wesleyan College and the University of Dallas. The purpose of the Association was to promote graduate education and research through cooperative program development and sharing of resources. An educational closed-circuit television network, interconnecting the educational institutions and industrial receiving locations in the region, began operation in September 1967.[1] The TAGER catalog describes the purpose of instructional television:

> The logistics of transporting either students or faculty between campuses of participating institutions presented a major obstacle to immediate large scale cooperation. However, member institutions recognized that a closed-circuit television network with talkback facilities would bridge the distances involved and provide an essential tool to accomplish efficient and immediate educational cooperative opportunities.[2]

In January 1970 TAGER applied for eight channels in the 2500 MHz range in order to "provide TAGERs immediate requirements for more receiving locations in the Dallas and Forth Worth area."[1] In technical and educational design the TAGER and the ACE systems are similar.

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[1] Letter, George E. Krutilek, March 6, 1970, p. 2.

[2] The Association for Graduate Education and Research of North Texas, Catalog, 1969.

C. Rochester Institute of Technology. The R.I.T. television center represents a different type of organization structure. R.I.T. operates the Center which "was created and exists primarily to improve instruction at the Institute." (Brochure) The R.I.T. center produces programs for the Institute and maintains a videotape library. In addition, however, programs originated in the R.I.T. center are transmitted by ITFS to the Rochester area. Institutions which desire to receive the R.I.T. signal install a receiving antenna and converting device; at present two four-year colleges, Nazareth and St. John Fisher, are cooperating with R.I.T. in a consortium which permits the exchange of credit and services between the three institutions.

D. Marquette University. As early as 1959 Marquette University in Milwaukee, Wisconsin, began consideration of cooperative programming with several smaller four-year colleges in the Milwaukee area. With funds available under Title VI of the Higher Education Act the institutions activated plans for the cooperative exchange of undergraduate instruction, particularly in the field of nursing. In the cooperative venture Marquette has developed programs which are available to the area colleges; at present Cardinal Stritch College and Alverno College, as well as the Marquette University College of Nursing, are participating in the program. Industrial plans have approached Marquette University in order to develop the type of industrial programming available through ACE and TAGER.[1]

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[1] Krutilek, letter, p. 1.

E. Indiana University. The ITFS channels allocated to Indiana University in Bloomington actually serve a consortium of colleges and universities which are members of the Indiana Higher Education Telecommunications System. The two ITFS channels relay programming of the IHETS to students in several university locations, including the campuses of Indiana University, Purdue University, Indiana State University and Ball State. In addition, these same ITFS channels serve to relay programming from the Indiana University Medical Center to nursing school and hospital locations through the Medical Educational Resources Program operated by the Indiana University Medical Center.

Medical systems

Medical schools, nursing schools and hospitals have, in recent years, developed extensive programs and pre- and in-service training of medical personnel. In several cases, these programs represent consortia of institutions which have shared programming on closed-circuit television and videotape internal distribution systems. Several of these existing cooperative programs have now begun to plan for and to employ ITFS as one method of distributing medical education resources to staff and students on location in hospitals and medical schools.

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[1] Bedwell, private interview.

The inclusion of the Medical Educational Resources Program within the Indiana Higher Education Telecommunications System represents one example of the employment of ITFS in medical education. The MERP, operating under the Medical School administration at Indiana University has, since 1967, provided videotaped programming to several institutions. Beginning in late 1969, the facilities of MERP have been expanded to relay videotaped programming to institutions in distant locations which formerly were on the videotape mailing circuit. The MERP, currently working through the Indiana Higher Education Telecommunications System, anticipates the eventual development of an Indiana Medical Television Network to further extend these resources in terms both of distance and of programming.

The ITFS system operated by the Wayne State University Instructional Technology Center serves a coalition of institutions offering nurses training programs. The coalition received a five-year grant from the Nursing Education Act to "significantly increase the number of Registered Nurses graduated" and to "raise the learning level" of the students.[1] The ITFS system distributes centrally designed and produced programs. From the point of view of instruction, all lessons are based on learning objectives agreed upon by representatives of each member of the coalition; each lesson, before it is distributed, is evaluated in terms of the stated objectives.[2]

Since 1967 the Fulton-DeKalb Hospital Authority in Atlanta, Georgia has operated an ITFS facility which transmits medical education programs from Emory University Medical School to more than 1000 students in training programs both pre- and in-service. The University of Cincinnati, Department of Biomedical Communication has recently begun a similar program for Cincinnati region medical personnel. In Milwaukee, the Regional Medical Instructional Television Station serves several hundred physicians, nurses and students at ten hospitals and schools. Construction permits have also been granted to the University of Alabama at Birmingham for an ITFS system which will be operated as a Community Medical Television network to distribute clinical conferences, seminars and courses for practicing physicians and related health groups. A similar program is planned by the University of Texas Graduate School of Biomedical Sciences at Houston which has been granted construction permits for two ITFS channels which will be activated to extend the coverage of the Medical Community Television System now serving twenty institutions in the Houston area.

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[1] Tintera, private interview.

[2] Ibid.

Inter-diocesan cooperation

A different type of cooperative effort is represented by the organization of diocesan ITFS systems for the production, purchase and rental of programming and for the cooperative purchase of equipment. By early 1967 four major diocesan systems--New York, Brooklyn, Detroit and Miami--were on the air, "Los Angeles was to be operating in a matter of weeks (and) the Federal Communications Commission had granted permits to eleven other dioceses to construct similar systems."[1] Father Culkin, in order to coordinate the activities of these systems, invited representatives of the dioceses to a meeting to discuss plans for cooperative possibilities. To insure attendance the February 1967 meeting was held in Fort Lauderdale, Florida.

At this meeting the representatives of the ITFS systems formed the Inter-diocesan Television Associates.

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[1] O'Shea, p. 2.

Purpose of this organization was to provide a means for diocesan systems to pool their efforts in applying for financial aid, in planning and producing programs and in purchasing programs, materials and equipment.[1] The incorporation notice of the ITA establishes the following goals:

> 1. To encourage the establishment and development of the use of educational television and instructional television fixed service in Catholic schools as well as in public and other private schools,
> 2. To coordinate the activities of Catholic schools throughout the U.S. relating to the use of instructional television fixed service,
> 3. To advise and counsel interested educational institutions in the planning of and preparations for the usage of ITFS.
> 4. To collage and disseminate information, visual aids and any other materials useful to educational institutions which are engaged in the use of ITFS or which plan to engage in the use of ITFS,
> 5. To establish and develop centralized television film and videotape libraries which will furnish to members programs of a high caliber,
> 6. To establish and develop production centers which will produce instructional programming peculiarly attuned to the needs of Catholic elementary and secondary schools as well as to make similar programing available for other public and private school systems,
> 7. To engage in any and all lawful activities incidental to the foregoing purposes except as restricted herein.[2]

This group continues to meet, to work to coordinate activities of member dioceses and to disseminate information about ITV.

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[1] Ibid.

[2] Incorporation Notice, Interdiocesan Television Associates.

Chapter V

Determining and Developing the Unique Role of ITFS

Cooperative efforts among school systems, colleges and universities and educational groups offer economies in terms of programming and facilities, but do not insure economies in terms of spectrum utilization. Increased interest in ITFS, combined with extensive federal funding, caused concern on the part of many individuals and interest groups over the imminent danger of spectrum saturation in some geographic areas. Many authorities, such as Frymire, expressed the urgency of the problem and the necessity of insuring the fullest possible development of limited channels "through the best possible engineering design of each system."[1]

The engineering goal expressed by Frymire may be facilitated through the careful coordination of plans for the development of ITFS systems in the perspective of the total telecommunications needs of a community; it may also be insured through actions of the Commission in regulating individual systems designs and in establishing priorities in the granting of ITFS permits. Local efforts at coordination range from computer-based channel allocations plans to the consortium in Cleveland by which individual users pooled their channels in favor of an allocation of time. To date, the Commission has not altered to any great extent its traditional policy in assigning or regulating channels.

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[1] Frymire, private interview.

Cooperative Efforts

Committee for the Full Development of ITFS

Several members of the Committee for the Full Development of ITFS recognized the danger and, from the beginning, had encouraged the development of local committees to coordinate regional development of ITFS. Committees were established, but the national group encountered difficulties in implementing any meaningful control. Cooper broached the subject at the March 15, 1966 meeting of the Committee for the Full Development of ITFS in a question to Chairman Robert E. Lee:

> The question has been to what extent will the FCC look with favor on subregional groups....Do they have your blessing? Do they have your approval to advise, coordinate and the like? How much power?...They want to be effective, and they feel they can be most effective if the FCC will indicate its approval.[1]

In his response to Cooper's question Commissioner Lee summarized the basic problem confronting the Committee today:

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[1] Official Report of Proceedings, March 15, 1966, p. 91.

> Of course, I think all of them will have to understand that the whole operation (of the committee) is purely advisory, and there is no real legal authority that they have. I think they have a real, practical influence with us....When they call something to our attention within their competence, they are ... going to get a little more consideration than the average citizen....I think it should be made quite clear there really is no legal authority. We are cooperating in this effort.[1]

At the January 1967 meeting of the Committee the problem of efficacy and organization were considered in depth. Again, the problem was stated by Frymire:

> This is a particular problem that we have been faced with since the outset of the establishment of the National Committee. No procedure or system ... We have not adopted a system of appointing state committees or local committees; we have never established criteria for doing this, nor have we ever adopted or suggested a method of communication and how the communication should be maintained and what it should contain, either from the Commission or from the regional chairmen, or from the state committees on up to the Commission. It has been a very haphazard program, one that has thrown ... an unusual burden on the part of the regional chairmen and certainly on the part of some of the active state chairmen. It seems to me that we may now be at a point in time where we should regularize our procedures in some way or other.[2]

In spite of Frymire's and Cooper's protests, no decisive action was taken to alleviate the problem of ineffectiveness of the Committee. The FCC did rule on January 16, 1967, that recommendations of ITFS committees be sought on ITFS applications:

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[1] *Ibid*., p. 91

[2] *Ibid*., p. 119.

> The Federal Communications Commission has announced changes in Form 330P, "Application for Authority to Construct or Make Changes in an Instructional Television Fixed Station," designed to achieve more efficient use of available frequencies.
>
> The revised form calls for additional information concerning if and when additional channels ... will be applied for, the boundaries of all adjoining school districts, and the location of proposed transmitters. An extra copy of Sections I and V of the form will be filed and *forwarded to the appropriate subcommittee of the Committee for the Full Development of the Instructional Television Fixed Service, and their comments and recommendations solicited.*[1] (Italics mine)

This ruling did not appreciably improve communication among the Committee or between the Committee and the Commission, nor did it solve the problem that the Committee had no legal authority.

Problems of poor organization and lack of authority continue to limit the effectiveness of the National Committee. In addition, the Committee is composed primarily of educational broadcasters and administrators rather than individuals directly associated with the instructional aspects of ITFS. Also, the Committee has no schedule for meeting and has met annually at best. Meetings are generally held in conjunction with regularly scheduled meetings of the NAEB, regional instructional television groups or related events. The 1970 meeting, held in San Francisco, represents the first attempt by the Commission to schedule local and regional meetings which might be attended by other representatives and members of the Executive Committee. Since members of the Committee travel at their own expense, the tradition of holding all meetings at FCC headquarters in Washington, D.C. has met with objections, particularly from West Coast representatives. Commissioner H. Rex Lee, who, in late 1969, replaced Commissioner Robert E. Lee as permanent chairman of the Committee, expressed the ambiguity regarding the role of the Committee at its February 1970 meeting:

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[1] Federal Communications Commission, "Recommendations of ITFS Committees to be Sought on Instructional TV Fixed Applications," Public Notice -B, 94474, issued January 16, 1967, p. 1.

> I sat in on one of your annual meetings last year ... and I saw Bob Lee chairing this ... and I wasn't quite sure what the role of the Commission was.... It wasn't until we started putting out notices ... after I had taken on this job, that I found that (it) was set up by executive order, and this was an FCC sponsored committee ... and this raised a question in my mind immediately.
>
> Is this the most effective way to have a committee? Have you advanced from the point that you should be weaned from the FCC and maybe have an educational committee sit in with the staff as an instant observer and assistant ... Maybe we should.... I think we need to face it very squarely, because I think there's a real question here as to how we can be most effective....[1]

Local Efforts

As Cooper and Frymire indicated in their remarks, the responsibility for cooperative planning at a regional level fell to the regional chairmen appointed by the Committee for the Full Development. The local sub-systems appointed by the regional chairmen, in spite of their legal impotence, assumed much of the responsibility for the systematic development of ITFS. Their assumption of responsibility was based on the knowledge that

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[1] Federal Communications Commission, Official Report of Proceedings of the National Committee for the Full Development of ITFS, San Francisco, California, February 27, 1970.

> Since the first system that went on the air, by its engineering design, would lay the base on which all other systems would have to be built, it behooved us to be sure that the first system was conceived and designed with the best aspects of technical engineering and brotherly love as we could possibly put into it.[1]

St. Louis-North Circle Project

An early attempt at coordinating local development of ITFS was included within the North Circle Project conducted by the cooperating schools of the St. Louis (Missouri) suburban area. The cooperating schools in the North Circle Project applied for an Office of Education grant "to study the feasibility of developing a comprehensive system for delivering instructional materials, handling routine administrative data, and exchanging teaching resources among school districts within a metropolitan area. The project attempted to discover alternatives both in hardware and software and their application to these three main generic areas."[1] In 1964 Paul Andereck, Director of the Audio-Visual Department of the suburban St. Louis Area, described the ultimate goals of the North Circle Project:

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[1] Frymire, private interview.

> Over a twenty-five-year span, the idea is to hook up every classroom in Metropolitan St. Louis with regional production centers ... and these regional or neighborhood centers would be hooked up with our new audio-visual centers. All day long there would be about ten closed-circuit channels receivable, simultaneously, in each classroom.... The eight centers would be co-operatively owned and operated by the districts in each circle or region. That way they would share personnel and equipment costs with neighboring districts. Signals from any of the eight centers could be routed through the Audio-Visual center to any of the other centers. This would allow interchange or sharing of programs.... Colleges in our area would be linked into the network so that high school students could take advanced placement courses. Libraries and museums would be linked into the network so that teachers could order materials from such sources, and they would be delivered by television.... All day long the system would be used for instructional purposes by the participating schools; all night long we would be sending films, filmstrips, tapes, still pictures, and book materials down the lines. These materials will be held on the videotape recorders for playback at the right time, the next day, by the teacher. The center would have data processing equipment to schedule and route all these signals. The same equipment would be used for doing school financial and student accounting for member schools.... Special lines would bring in the MPATI and other television programing not now receivable in our schools.[2]

Phase B of the North Circle Project attempted to determine what would happen if an applicant would initiate a proposed system and what effect his application and implementation would have on future applicants. The program, contracted to McDonnel Automation Center, established the design of a program and set of procedures for candidates to follow.[1] In describing the purposes of the program the June 1967 report of the study group stated:

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[1] Letter, Calvin L. Owens, Associate Director, Audio-Visual Education Department, Cooperating Schools of the St. Louis Area, February 10, 1970.

[2] Griffith and MacLennan, pp. 142-43.

> Although the North Circle plan for processing data honors both technical and geographic information, it does not comprehend political considerations. A technically desirable point for signal emanation may be politically undesirable or impossible....
>
> Even if the proposed planning tool were to show how all 171 eligible applicants in the St. Louis Area could activate four non-interfering transmitters each, this total accomplishment of such a plan is unlikely. It might be a basic pattern toward which those who would activate transmitters should strive, but it also represents the pattern from which activators must necessarily deviate. This deviation represents the political, economic, or psychological reasons employed in system implementation. Yet, a theoretically perfect plan, modified by numerous practical deviations from such a plan, would still seem preferable and more efficient than random placement or independent and minimal-thought planning.
>
> Presuming that the North Circle planning tool would not be adequate to provide the required number of transmitters to meet actual future demand, or that deviations from this plan would reduce the number of transmitters to create a supply unequal to demand, there still must be some allocation plan to accompany any siting plan....
>
> Even though the program presented in this report has not yet been applied.... it is assumed that each area must be prepared to contend with overdemand and inadequate supply. Even with the best planning, and certainly if no planning at all occurs, the eventuality of saturation must be anticipated....
>
> From the start, it was assumed that the plan itself ... must be self-enforcing. Since the Federal Communications

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[1] Owens, letter.

> Committee (sic) is committed to honoring applicants on a first-come-first-served basis and has no power to force any authorized applicant into a restrictive position in comparison to another legitimate applicant, the applicants who do approach the FCC for permission to activate channels must do so with self-restraint. This can be achieved through enlightened self-interest or under the influence of social pressure by peer school-units whose favor is esteemed by the applicant....
>
> It is hoped that development of siting plans and allocation plans which eliminate surprise moves by neighbor schools and which give applicants more assurance of stable, continuing conditions and more channels of communication would be preferred over non-planning. This advantage could be a basic controlling factor, thus eliminating the need for restrictive, negative action.[1]

The Higher Education Coordinating Council, an organization composed of all levels of education in Metropolitan St. Louis, formed an Ad Hoc Committee to assess the role of ITFS service, to screen applicants and to coordinate activities in the area. Subsequently, the Ad Hoc Committee has been dissolved and a standing committee established who will hear applications and make recommendations to the FCC. To date, no school in the area has moved in the direction of utilizing the existing ITFS facilities.[2]

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[1] Warren A. Boecklen, et al., A Computer Study for the Allocation of Channels and the Placement of Transmitters for 2500 MHz Fixed Station Service in a Metropolitan Area Containing Many Eligible Applicants for Licensing, report prepared for the Cooperating Schools A-V Corporation of St. Louis County (St. Louis, Missouri: Instructional Materials Center Audio-Visual Department of the Cooperating School District of the St. Louis Suburban Area, June, 1967), pp. x-xi.

[2] Owens, letter.

California-Los Angeles

Frymire, who left the Educational Broadcasting Branch at the Commission to head the California State Television Advisory Committee, strongly advocated the development of ITFS as a non-competitive aspect of educational telecommunications.[1] His personal opinion was reinforced by a report of the consulting engineering firm of Hammet and Edison, commissioned by the State of California to "design a television system that would cover all of the cities in California having a population greater than a thousand people." The Hammet and Edison report concluded that, in light of crowded broadcast spectrum and the expense of cable, "it is very likely that the ITFS service will eventually have to carry almost all of the instructional television programs."[2]

At the same time, Frymire recognized that the solution to the problem of channel shortage lay in careful engineering design. In 1966 the state plan for educational television Frymire reported:

> Present FCC rules limit such transmitters to relatively low power and inhibit their use for wide-area coverage.

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[1] Frymire, private interview.

[2] Lawrence W. Templeton, "ITFS Channel Allocations," Remarks delivered at the West Coast Assessment Conference on ITFS Allocations (San Francisco, California, May 4-6, 1967), p. 2.

> Assuming these limits are removed, there will remain the serious problem of more potential users than channels available.... Committees have been formed in an attempt to improve ITF allocation efficiency through voluntary engineering coordination. However, all qualified and interested districts cannot be granted even a single channel for their exclusive use. Thus, the identified need for multichannel service will not be met. A major recommendation of this study is that most of the ITF channels be committed to the jurisdiction of an "*educational common carrier*" in each metropolitan area to serve a variety of school needs in much the same manner as do the present ETV stations.... The present trend of development in which facilities are installed, maintained and operated exclusively by one district on a "first come, first served" basis is unavoidably wasteful of both frequencies and equipment in the metropolitan areas.[1] (Italics mine)

Because of the reluctance of administrators to relinquish local control of their ITFS systems the common carrier concept proposed by Frymire was not accepted by California educators.

Local and regional groups in California were highly successful, however, in cooperative approaches to ITFS development. In Los Angeles the problem of limited channels was compounded by the fact that a majority of the 90 industrial users operating in the 2500 MHz band as Operational Fixed Stations were in the Los Angeles basin. The Archdiocese of Los Angeles applied very early for 12 channels; by early 1966 several school systems, including Pasadena, Fullerton,

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[1] Television Advisory Committee, State of California, *Educational Television in California: Existing Facilities, Future needs and a plan for development* (Sacramento, Calif., May 1, 1966), Section 1, p. 9.

Placentia, North Orange County Junior College, Long Beach, Alhambra and Torrance, had expressed interest in applying for ITFS frequencies.[1] In January 1966 educational interests in the Los Angeles area organized a committee to provide information to educators about ITFS, to study the prospects of saturation and to work out solutions to potential problems. Chairman of this Advisory Committee, Allan Fink, reported the early activities of the committee to the Committee for the Full Development of ITFS in March 1966.

> Early in the field when we discovered the number of users already in the Los Angeles area I personally contacted all of the industrial and governmental users to share our concerns, and quickly, we discovered that our future lay in working on a cooperative basis and closely together.... On the 3rd of March this following body of people came together to really take its first real close look at the problem:
>
> We had the Union Oil and Tidewater Associated Engineering Staff, the Los Angeles City Water & Power Department of Engineering Staff, Socony Mobil Engineering Staff, the Riverside County Governmental Agency representative from the Engineering Department.
>
> We had our educational station management represented.... We had the Office of the Los Angeles County Superintendent of Schools represented with a number of people. The Archdiocese was represented and the Pasadena City Schools, and a group of schools around Fullerton, California,.... We had engineering representatives from RCA, Litton Industries and an engineering representing Pasadena City Schools. That is quite a body of engineering talents gathered, and ... I think it demonstrates the vital interests that all these people have, the willingness to come together to identify the problems.[2]

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[1] Official Report of Proceedings, March 15, 1966, p. 13.

[2] Ibid., p. 9.

This regional group, and others established throughout the state, did not have the authority to apply for frequencies as Frymire had recommended, but it did have the recognized responsibility to review all applications for ITFS permits. In considering its charge, the Committee soon admitted that

> It would be a rather conservative statement to say that what we need is some good engineering advice. We probably need an engineering allocation study to try to determine what the best possible use of these frequencies would be in our area.[1]

In light of this realization, the same consulting engineering firm of Hammet and Edison was again commissioned in 1966 to propose solutions to the specific problems inherent in ITFS development. In a report to the May 1967 West Coast ITFS Assessment Conference on ITFS allocations, held in San Francisco, Lawrence Templeton, representing Hammet and Edison, described the alternatives considered by the firm and by Frymire, in determining the best possible solution to the potential problem of shortage of channels:

> First, a set of engineering rules similar to the FCC rules in force for commercial broadcast television, but more complicated to take into consideration that discrimination that can be obtained from little receiving dish antennas and the sharp transmitting patterns that can be obtained. By only authorizing new systems that conform to this set of rules, the multiplication factor--that is to say an increased usage of the channels available--of about 3 would occur with the approach. The

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[1] *Ibid.*, p. 12.

> drawback to this approach is that in a large city--when the service begins to mature and there are very many stations operating--the application of any set of engineering rules, of any comprehensive set, and a comprehensive set would be needed if this multiplication factor were to be achieved, would be very difficult simply because of the very large number of transmitters and receivers which would have to be considered.
>
> The second possibility was to prepare a computer program that would follow the engineering rules approach. The computer would be trained to consider all of the fine structure, the fine detail of engineering of these systems, the antenna patterns, the transmitter heights, receiver heights, the transmitter power, the effect of the atmosphere of the signals, the effect of frequency separations, a very large number of considerations could be handled by the computer and for very large numbers of transmitters and receivers at a reasonable cost.
>
> The third alternative was the preparation of an allocations plan. The full allocations plan would determine the requirements for channels in various locations, school districts, population centers, and then would employ a computer to fill those requirements. The allocation program would use the engineering computer program just mentioned but would use it as a tool to select channels for the school districts and the student population that had to be served. The computer program would consider each population center, and each school district and assign channels to this district that could be used without interferring with the systems of other districts. So the output would be a complete plan. Each school district would be assigned channels, and perhaps within limits, transmitter locations, antenna patterns, and antenna power. The channel multiplication factor that might be obtained with this approach would be perhaps as great as 10; in other words, instead of 31 channels being available, perhaps 310 different program services could be transmitted over the basic 31 ITF channels without serious interference.[1]

The Hammet and Edison Company program was field tested in the Los Angeles area. Templeton reported that the Los

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[1] Templeton, pp. 7-8.

Angeles basin "was an excellent test case because of the 35 existing Operational Fixed Stations and because there were applications on file for 22 ITFS transmitters and about 200 ITFS receivers." On the basis of the field test, several applicants in the area adjustment equipment and dismissed channel allocations.

Several other regions have subsequently employed the computer program designed by Hammet and Edison in determining the engineering design of their ITFS systems.

Cleveland Metropolitan area

The type of common carrier concept envisioned by Frymire met with greater acceptance in the Cleveland, Ohio, metropolitan area. In early 1967 the Cleveland area was the first in the nation where the potential problems of channel saturation threatened to become an immediate reality. The first channel to go on the air in September 1964 was in Parma, Ohio, a suburb of Cleveland. Soon after, the Cleveland Archdiocese applied for and received permits on twenty ITFS channels. The Educational Research Council of Greater Cleveland and the Cleveland Board of Education each applied for four channels. The Educational Television Association of Metropolitan Cleveland, which operated the community television station, WVIZ, Channel 25, applied for four channels in order to supplement its broadcast service for the secondary school system.[1]

When the flood of applications reached the FCC, the Commission could not exercise its traditional first-come, first-served policy. "We decided to toss the ball back to the interested parties in Cleveland and ask them to find a solution to their problems," according to Hillard.[2]

The several educational interests in Cleveland approached the solution to the problem "somewhat at arms' length" at first.[3] For fourteen months the educators worked together to devise the sort of public utility arrangement that had been proposed in California. Participants in the negotiations included the Diocese of Cleveland, the Cleveland Commission on Higher Education, which represented area colleges and universities, the Board of Education of the Cleveland City Schools, the Cuyahoga County School Superintendents Association, which represented area schools including those which had not previously expressed interest in ITFS, the Education Research Council, the Board of Education of the Parma City School District, and the Cleveland Academy of Medicine.

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[1] Alan Stephenson, private interview in Cleveland, Ohio, August 14, 1969.

[2] William Hickey, "Umbrella TV Agreement Scores Cleveland a 'First'," Cleveland Plain Dealer, June 28, 1968, p. 9.

[3] Stephenson, private interview.

The lead in the negotiations was taken by WVIZ, which proposed an umbrella agency, operated under the Educational Television Association of Metropolitan Cleveland. According to the proposal, all interested parties would sign a contract to work together in the development of 2500 MHz television on a community-wide basis. The ETAMC, in turn, would apply for the permit and hold it in trust for the parties to the agreement and any future users; WVIZ would act in the role of public utility. Actual control would be by a controlling board, elected by the members, which would be responsible for the formation of plans for allocation and use of channels, scheduling time, coordination and use of programming, establishment of fees and charges, and all other administrative functions.[1]

After more than a year of planning by the consortium and processing by the Commission, the FCC, in March 1969, granted the application by the ETAMC proposing use of sixteen ITFS channels. In making the grant, the Commission waived Section 74.902(c) of the FCC Rules which provides that a licensee is limited to four channels for use in a single area of operation.[1] By agreement, the Parma Board of Education has dismissed the reservations on its four remaining channels but will continue to operate its transmitter on channel A-1. The diocese, which had not activated its channels, will request the Commission to dismiss its existing construction permits on twenty channels.

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[1] Federal Communications Commission, "Application for New Instructional Television Fixed Station at Cleveland, Ohio, Granted by the FCC," Broadcast Action, Report No. 8006, issued March 24, 1969.

WVIZ will operate and maintain the ITFS transmission equipment and will provide studio space, if needed, to individual users. The individual school systems and organizations participating in the ITFS operation will subscribe to it, but each may also provide its own programming or share in materials transmitted by other systems. Costs of local programming and distribution and charges for printed resource materials will be borne by the developing agency. No one group will have a channel, but each will be allocated time, determined by the governing board in accordance with the party's request and with the amount of time available. The only required place by the ETAMC on the member groups is that the programming be of minimum broadcast quality.[2] The ITFS system will be operated as a complement to broadcast Channel 25. Since the two systems will not be competitive, participating schools will be able to use both ETV and ITFS programming.

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[1] Ibid.

[2] Stephenson, private interview.

There were enough "educational statesmen" involved in the original agreement to realize that there were other agencies who had not applied but who would, in the future, require ITFS time. To protect the rights of non-charter members, membership in the consortium will be open to other agencies "whose only crime was that they were not quite as aware of ITFS at this point as we were."[1] Future members will share full organization and representative rights.

At present, two channels, including one STL, are operating on a demonstration basis, simulcasting Channel 25. According to the utilization plan, programming will begin in Fall 1970; present indications are that the diocese will be the first member of the consortium to initiate programming on the ITFS channels.[2]

Educational interests are watching carefully the progress of the Cleveland consortium. This is an idea that has been advanced since the establishment of 2500 MHz television for education, but, as with the technical aspects of ITFS, it is an untried organizational technique. To Frymire, the Cleveland plan represents the "type of conceptional development that should take place." Other authorities, more skeptical of the political expediency represented in the consortium, are withholding their decisions.

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[1] Ibid.

[2] Stephenson, response to questionnaire.

Priorities

The Committee for the Full Development of ITFS has attempted to foster the type of local cooperation evident in the St. Louis, California and Cleveland plans. At its November 1968 meeting the Committee considered the establishment of priorities for channel allocations to prevent spectrum saturation. The concern of the Committee members was that the available channels would be allocated before the potential users of ITFS could be identified or would be able to act to reserve limited channels. Samuel Saady of the Commission expressed the problem faced by the FCC in processing applications:

> That question that comes up then is if you preempt the field quickly for those who are able to go now, you have a tremendous problem for the future. For example, the public schools have not been able to mobilize the money, the help or the resources, particularly in central core areas of the cities, as could the university systems, so you get a situation in a large urban area where you get two or three universities coming in, each wanting a four channel system. Those are twelve channels gone. In that central city area with four channels gone, you have right now based on your present technology four channels left for the totality of the public school population.[1]

The Committee recommended cooperative planning, closer coordination with ITFS subcommittees, and suggested the development of consortia on the local level, as well as the preparation of a list of licensing priorities.

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[1] Federal Communications Commission, Official Report of Proceedings of the National Committee for the Full Development of ITFS (Washington, D.C., March 20, 1969), pp. 50-51.

In preparation for the March 1969 meeting of the members of the Executive Board of the Committee were polled to determine a statistical consensus concerning priorities for presentation to and discussion by the Committee. The following set of proposed priorities was presented to the Committee in March 1969:

I. Service/Level
   1. Elementary
   2. Secondary
   3. College and University
   4. Post-graduate professional (including medicao)
   5. Post-graduate professional (in-service, industry and other non-medical)
   6. Pre-school
   7. Training (police, fire, etc.)
   8. Information and special services (minority groups, etc.)
   9. Other, including federal government uses.

II. Control/Licensee

Order of Priority

1. Public local education (system, institution).
2. Individual community non-profit educational organization not an ETV station.
3. Consortium of non-profit community educational institutions and organizations, not centralizing control through an ETV station.
4. Public state education (system).
5. Consortium of non-profit community educational institutions and organizations contralizing control through an ETV station.
6. Private regional education going beyond local boundaries (i.e., Archdiocese).
7. Private local educational institutions.
8. ETV station.[1]

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[1] Ibid., pp. 28-29.

The imposition of this type of priorities policy met with considerable opposition by members of the Committee, who stressed, rather than the imposition of rigid priorities, support of local cooperative efforts and the necessity of the systematic development of ITFS in concert with other aspects of educational telecommunication.

Commissioner Robert E. Lee, in limiting discussion of the matter of priorities by the full Committee, appointed an Ad Hoc Sub-Committee, chaired by Dr. Harold E. Wigren of the Department of Audiovisual Instruction, National Education Association, to consider the matter of priorities for ITFS. The Ad Hoc Sub-Committee, on June 19, 1969, presented its formal recommendations to the Commission. In these recommendations, the Sub-Committee stressed, first of all, the necessity of local cooperative development of ITFS:

> It is recommended that:
>
> 1. Local ITFS subcommittees shall plan for and recommend to the FCC allocations of ITFS channels in their respective communities, as requested by the FCC in ITFS Application Form 330 P. Each subcommittee shall include representation from all of the potential ITFS users within the proposed service area, and shall have prime responsibility for frequency coordination. In order to maximize efficient frequency utilization, the local subcommittees shall coordinate with the adjoining communities or committees which would be affected by its action.
>
> 2. Procedures and guidelines for the local ITFS subcommittees should be delineated in a handbook or by some other means, and distributed by the National Committee for the Full Development of ITFS. These recommended procedures and guidelines should include the following:

a. The needs and purposes to be served by the local committees.
b. The types of institutions and individuals invited to participate on the local committee.
c. Geographical area which a local committee should encompass.
d. The extent of authority of the local committee and the appropriate functions in which it should engage.
e. The criteria which local committees should use as guidelines in evaluating applications.
f. The types of information which applicants should submit to local committees for evaluation.
g. The kinds of reports, together with necessary forms, which local committees should submit as they make recommendations.
h. The guidelines for coordinating the work of local committees in adjacent areas.

3. In evaluating applications, the criteria which local committees should use as guidelines are:

a. The proposal should represent an effective utilization of the frequencies involved (for example, time sharing among two or more users, or the limiting of signal strength to that necessary to cover the proposed service area, or the allocation of frequencies and the selection of transmitter sites to maximize channels available in an area).
b. The proposal should reflect cooperative planning for future channel use.
c. Consideration should be given to the unique and special role of ITFS in relation to, and as a part of, the broader development of an educational telecommunications systems to serve the educational needs of the area....
d. The proposal should reflect the nature and severity of the educational problems and needs with which the applicant will deal. Valid priorities will differ from one location to another. Local subcommittees, therefore, must develop their own priorities, taking into account the guidelines that will be suggested in the proposed handbook....
e. The proposal should show evidence of program planning which is realistic in terms of the applicant's capabilities and resources.

> f. The proposal should reflect whether or not the applicant is ready to employ ITFS and carry out its proposed objectives. It should also reflect whether or not the applicant has a practical plan for phasing all channels into operation in a reasonable period of time....[1]

The emphasis of the subcommittee members was that the key to effective utilization of these criteria is a strong local subcommittee, authorized to coordinate and regulate the activities of community interests. The subcommittee members dismissed the establishment of rigid priorities such as those earlier presented to the National Committee.

> As one committee member put it, "Who are we to sit in Washington and say that programing for pre-schoolers should have priority over programing for senior citizens in all localities? Things might look very different in Sun City, Florida, than they do in Atlanta, Georgia, or Grosse Point, Michigan. Severity of need for occupational training might be far greater in an area with under-employment than in an area with near-full employment."[2]

Implicit in local control, however, is a reversal of the Commission's policy of first-come, first-served. Since the only sanctions are those exercised by the Commission in its processing of applications, some feel that prospective ITFS users, in the manner of public broadcast licensees, should be required by the Commission to demonstrate the manner and extent to which they will serve the interests and needs of the total community.[1] The established policy of primary and secondary uses of ITFS channels should, perhaps, be re-examined in terms of total community interests.

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[1] Recommendations of the Ad Hoc Committee of the National Committee for the Full Development of ITFS, submitted to Commissioner Robert E. Lee, June 19, 1969.

[2] Ibid.

Increased Channel Availability

The Ad Hoc Sub-Committee concluded, however, that the establishment of local cooperative groups in the manner recommended would not be sufficient to solve the problem of channel shortages. Frank Norwood, Executive Director of the Joint Council on Educational Telecommunication and a member of the Sub-Committee, appended a statement outlining recommended research in which he describes the situation:

> The Ad Hoc Subcommittee on Priorities of the National Committee on the Full Development of ITFS recognizes that the problems with which it has been asked to deal result from a single cause: the increasing shortage of ITFS frequencies. Created by the Commission as an answer to the "economy of scarcity" which limits the effectiveness of VHF and UHF instructional television, ITFS now manifests its own list of "impacted areas" and that list is sure to grow as the unique advantages of multiple address television systems are more and more widely recognized.
>
> The problems of judging among competing applicants, of assuring a reserve supply of frequency assignments to fill the needs of future users, and like considerations, would all disappear if it were possible to provide channel resources sufficient to meet the needs of all present and future applicants. If, as with the telephone, it were possible to provide communications service to all

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[1] Frank Norwood, private interview at J.C.E.T. headquarters, Washington, D.C., December 30, 1969.

> who would benefit without impinging upon the needs of present and future users, neither priorities nor judgments of Solomon would be necessary.[1]

Regulations on engineering design

One solution to the problem of channel shortage proposed by Norwood and the Sub-Committee is the examination by the Commission of "the advantages which might be gained by more stringent engineering constraints in present ITFS assignments."[2] Norwood, expressing a fear that "the Commission has been too permissive with education," recommends that the techniques of interference-reduction outlined in the Report and Order on Docket 14744 be enforced:

> (a) Since interference in this service will occur only when an unfavorable desired-to-undesired signal ratio exists at the antenna input terminals of the affected receiver, the directive properties of receiving antennas can be used to minimize the hazard of such interference. Interference may also be controlled through the use of directive transmitting antennas, geometric arrangement of transmitters and receivers, and the use of the minimum power required to provide the needed service.
>
> (b) An applicant for a new instructional television fixed station is expected to take full advantage of such techniques to prevent interference to the reception of any existing operation fixed and international control station or instructional television fixed station at authorized receiving locations. In cases where it can be demonstrated that potential interference could be effectively controlled with practical refinements at

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[1] Frank Norwood, Statement on Recommended Research, Appendix to Recommendations submitted by the Ad Hoc Subcommittee on Priorities.

[2] Ibid.

> such existing receiving locations, the user of the receiving installation is expected to make the needed refinements if interference-free reception is desired.[1]

While an applicant for an ITFS permit is required to state the power of his transmitter and its location, it is assumed but not specifically determined that he has fulfilled the other "expectations" of the Commission. Many authorities feel that the reluctance of the Commission to impose stringent regulations on educational interests, while motivated by a desire to provide an economical system, may be too costly in terms of spectrum conservation and, ultimately, may prove equally costly in terms of re-design of poorly constructed systems.[2]

Spectrum utilization

A second solution to the problem of limited channels proposed by the Sub-Committee is examination by the Commission of other portions of the radio spectrum which might be utilized by education to complement existing methods of telecommunication. Norwood describes "two recently developed technologies in the millimeter wave region (which) appear to be worthy of close examination":

> a. Amplitude Modulated Links. This 18 GHZ system, developed by Hughes, and now being tested in New

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[1] FCC, Rules and Regulations, 74:903.

[2] Norwood, Templeton, Parker.

York (KA2XQH), can deliver 12 VHF channels and the entire FM band over a single carrier. Additional tests have been authorized by the Commission in Farmington, New Mexico, and Eugene, Oregon. These tests are in connection with the operation of CATV systems, but it is apparent that the technology could also be applied to instructional television.

b. Quasi-Laser Systems. The system has been demonstrated before the FCC in the 42 GHz region, and its developers, Laser Link Corp. and Chromalloy American Corp. make the claim that it can be operated at any frequency between 10 GHz to 10,000 GHz. A single carrier is said to be capable of more than 32 TV channels. Costs are claimed such that a 20-channel Quasi-Laser System would approximate the present cost of   channels of service in the 2500 MHz band.[1]

These portions of the spectrum are specified by Norwood only as examples of possibilities. Several other authorities have similarly suggested that the Commission examine specific portions of the available spectrum. For example, Dr. Bernarr Cooper, at the February 1970 meeting of the National Committee noted that

> There is a portion of spectrum, 2150 to 2160, which is labeled for experimental, and developmental purposes. Therefore, there is no regularization, and indeed, there is no equipment, FCC-type accepted equipment developed. This was another portion on which I'd like to raise the question, would it be a possibility? I know we have no answers here immediately ... but I raise it for the record to indicate other possibilities.[2]

Similarly, Albert J. Morris, President of Genesys Systems Inc., suggested at the same meeting, the exploration of the

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[1] Recommendations of Ad Hoc Subcommittee.

[2] Official Report of Proceedings, February 27, 1970, pp. 37-38.

2400-2500 MHz band, now reserved for Industrial, Scientific and Medical purposes. In a subsequent letter to the new chairman of the National Committee, Commissioner H. Rex Lee, Morris documented the rationale of his recommendation:

> Part 19 of the FCC Rules and Regulations covers Industrial, Scientific and Medical Equipment (ISM). These Rules allow unlimited operation within the ISM bands. They also allow ISM equipment operation at any frequency before 5728 MHz except in three very narrow bands of frequencies below 9 MHz. Where ISM equipment is operated outside of ISM bands, radiated energy must be suppressed to below 10 microvolts per mit at a distance of one mile or more from the equipment. The FCC clearly allows ISM equipment to be used in bands allocated to other services subject to certain constraints. This results in a sharing of frequency allocations between ISM equipment and other sources on a non-interference basis....
>
> There is precedence for frequency sharing between communications and ISM equipment within ISM bands.... It appears to be FCC policy to allow such sharing of ISM bands with the communication's user bearing the burden of making his system work properly....
>
> The real question that must be asked relates to the probability of an ISM system interfering with a television system operating in the ISM band. We think that this probability is low. Also, where such interference exists we think that it can easily be cured.
>
> There is no (reasonable) way that an ISM user can interfere with television transmitters. Therefore, the only potential problem is interference between ISM equipment and television receivers in the same band.[1]

The type of thinking and spectrum examination implicit in each of these suggestions reflects the type of thinking that led to the original rule making which authorized ITFS and is consistent with the contention of the Ad Hoc Sub-committee "that effectively increasing the supply of instructional television channels to meet present and future demands is far preferable to attempting any system of 'rationing' scarce channels to an educational community whose demands for ITV are constantly increasing."[1]

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[1] Letter, Albert J. Morris to Commissioner H. Rex Lee, March 10, 1970.

Unique Role of ITFS

Paramount to the deliberations of the Ad Hoc Sub-committee and to any future development of ITFS is the realization that ITFS does not exist in isolation but as one aspect of educational communication. The 1967 survey of CCTV/ITFS facilities anticipated the significance of this perspective:

> Looking ahead to the years beyond this decade is perhaps dangerous. But there are trends in communications which indicate interesting developments are ahead. What we now call "closed-circuit television" may indeed in future years be the basis for the total audio-video-computer-communication system. There are signs of its development already. Community antenna systems are spreading.... The trend toward individualized communication systems in the field of entertainment, information and education is evident. It is not far-fetched in light of these developments to describe the future communication system for education as part of a general nationwide and to some extent worldwide system which brings to every classroom, as well as to every home and place of business, multi-channeled, random accessed, two-way and widely varied audio and video signals for a wide variety of purposes....

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[1] Recommendations of Ad Hoc Sub-Committee.

> Just as we now link virtually every home in America by electric and telephone wires, in the future we will link all by a point-to-point system of the multi-channel capabilities.... How will education use such a communications system? The implications are staggering but we can meet the challenge if we will but fix our sights on the essential instructional goals and look beyond the limitations of 1967's technology and stereotyped conventional uses we now all too often employ.[1]

In opposing the imposition of rigid priorities on prospective ITFS applicants Wigren emphasized the type of systems design that must determine the unique role of each available method of communication:

> It seems to me that with all of the possibilities now available to us through cable, be it closed circuit or CATV, through the many other facets, even broadcast ITV and all of the others, sooner or later we need to look at the whole gamut and say to ourselves what now are the unique contributions of ITFS to the systems approach.... I think all of these systems sooner or later will be used, and they won't be competitive with one another, but we ought not to be actually using each of them to do the same thing. We ought to sooner or later be asking some perceptive questions about what is really the unique role of each of these to the total system of telecommunications of which they are a part.[2]

Some of the unique features incorporated in the technical design of ITFS have not yet been fully capitalized upon. Recent engineering developments, however, throw new light on the existing potential of the system.

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[1] DAVI, CCTV Survey, 1967, p. 4.

[2] Official Report of Proceedings, March 20, 1969, p. 30.

Audio and data transmission

Although the name of the service suggests that ITFS is limited to the transmission of television signals, nothing in the FCC regulations prohibits the use of audio transmission alone, the introduction of facsimile or the interconnection of computers and terminals by ITFS. The importance of this fact is predicted by Templeton:

> Computer and other forms of communication may--in the long run--occupy at least as much channel space as video does now.... We look forward to the day when this may be even be called instructional television service, but perhaps the instructional communications fixed service. Since computers are perhaps an even more unknown quantity than video and offer a great deal of promise, we suspect that in the long run, the requirements for channels to interconnect with students may at least equal that of television.[1]

Since 1967, when Templeton offered this prediction, several factors have worked to increase the importance of this use of ITFS. Computers are now designed with the capability unknown five years ago; at the same time, the cost of computer hardware and, above all, programming to utilize the available capability, has risen sharply. Therefore, computers are able to do more, but they must do more in order to be cost effective. Costs must be spread by increasing both the users and the uses of the hardware. Interconnection of remote terminals by means of ITFS, the possibility of using the interconnecting channels for both instructional and administrative purposes [and the various modes of communication possible via ITFS], offer distinct advantages. Several systems now operating television channels contemplate future development of systems for the transmission of other types of information.

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[1] Templeton, p. 2.

Response systems

A recent amendment to the FCC Rules and Regulations governing ITFS may expand and change dramatically the unique character of the system. In its Second Report and Order on Docket No. 18346, effective April 17, 1970, the Commission authorizes the use of the 2686-2690 MHz range for response stations "to provide communication by voice and/or data signals" between a fixed station operated at an authorized location and an associated ITFS station. This type of two-way communication system has long been advocated by educators; several instructional television systems incorporate the elements of two-way communication, usually by means of telephone. Carpenter and Greenhill, in their 1962 study of television facilities, described the importance of such techniques in the educational process:

> Communication facilities, and particularly those which fall into the classification of "mass media" provide for the uni-directional flow of information, instruction, and stimulus materials from a source to individuals, singly or in groups.... Additional auxiliary facilities, efforts, and arrangements are required to provide for reciprocal communications from readers, listeners, viewers, or learners which will influence and regulate

> the kinds, rates, and flow of the communication.... The media of communications are mainly uni-directions ... and this is not always adequate for instruction. Ideally, conditions for learning resemble intense and engaging conversation; a person speaks, another responds; the interactions are both progressive and reciprocal....
>
> There is another related concept: The essential conditions for learning include interactions between the learner and the information or materials to be learned. The effectiveness of learning ... importantly depends on the intensity, persistence, precision, and extensity of the learning interactions of individuals with the information or instructional content.
>
> Furthermore, modern views of learning generally agree that controlled reaction of students to learning materials requires knowledge of the appropriateness or inappropriateness, correctness or incorrectness of students' learning response.... However, the basic requirements stated briefly above emphasize two main points: (1) Television facilities, as presently conceived and operated, have limitations in providing several important and essential conditions for effective learning. (2) Supplementary or auxiliary facilities and supplementary instructional and learning activities are needed in order to arrange for these conditions.[1]

The relative permissiveness of the FCC rules regulating ITFS have allowed several systems to operate, on an experimental basis, various forms of response stations of the type recommended by such authorities as Greenhill and Carpenter. In early 1968, for example, the Brooklyn diocesan school system conducted experiments with a touch-tone telephone response system in which in-service teachers received instruction by means of television and responded to the instruction by means of touch-tone signals. The signals, transmitted to a computer, were compiled and made available to the study teacher. The experimental system incorporated the basic elements of computer-assisted instruction, response evaluation, systems and a form of centralized data processing.[1] Reverend Michael J. Dempsey, director of the Brooklyn ITFS system, reported on the experiment in his February 1968 newsletter to teachers in the system:

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[1] ETV: The Next 10 Years, pp. 325-26.

> We recently completed an experiment, run jointly with I.B.M., that may hold great significance for the future relationship of education and technology.... Basically it combined the use of television and computers to teach a short course about computer technology and programming to a group of about 130 teachers in our schools.
>
> The experiment is significant because it units the main advantages of both television (the ability to reach many people simultaneously) and the computer (the ability to deal with one individual in terms of his own specific needs) in teaching a group of people. With this combination you achieve in a beginning way that much-to-be-desired educational objective of teaching many students more economically while maintaining an individual relationship, with dialogue, with each student.[2]

During that same month, February 1968, Stanford University petitioned the FCC to amend its rules to provide for the use of low-powered, voice modulated transmitters for response stations in the upper four MHz of the ITFS band. The Stanford proposal was designed to permit students receiving instruction via an ITFS channel to communicate with the instructor in order to ask and respond to questions as in the classroom. The Commission, in its Notice of Proposed Rule Making on Docket No. 18346, described the purposes of the response stations:

---

[1] Reverend Michael J. Dempsey, private interview in Brooklyn, New York, July 31, 1969.

[2] Dempsey, "From Fr. Dempsey's Desk..." Televisions, Newsletter of the Diocesan Educational Television Committee, V, No. 5 (February, 1968), p. 1.

> The ability of students to communicate directly with the instructor does offer several advantages. Questions may be asked and answered during the course of instruction. Obscure points may be cleared up and ideas exchanged. Psychologically, communication between students and instructor would provide many of the features of personal instruction and thus soften the coldly impersonal aspect of normal television instruction.[1]

In specifying the engineering design of the response stations Stanford suggested

> that the band 2686-2690 MHz be divided into 31 channels, each 129 kHz in width. This would provide one response channel for each of the 31 instructional television fixed station channels. Power requirements would be nominal, in most cases approximately 200 milliwatts. In a few instances, power of up to 2 watts might be required. Frequency modulation would be employed with a carrier excursion at maximum modulation of no more than 25 kHz above and below the unmodulated carrier frequency. Transmitters with a frequency stability of approximately 14 parts-per-million (plus or minus 35 kHz in the proposed band) are said to be practical. Directional transmitting antennas would be employed, concentrating the radiated energy toward the associated instructional television fixed station location and thereby minimizing potential interference to other users. More than one response station at more than one location might be used in conjunction with a single instructional television fixed station. However, all would share the same ITFS response channel.[2]

---

[1] Federal Communications Commission, Docket No. 18346, Notice of Proposed Rule Making, FCC 68-998, adopted October 2, 1968, p. 2.

[2] Ibid., p. 1.

The immediate request from Stanford was for two-way verbal exchange between students and their instructors in conjunction with live broadcasts; the response channels designed by Stanford were to complement the existing continuing education program operated by the University at San Francisco area industrial locations. The petition, however, drew testimony from other interested parties who advocated the authorization of response channels for other forms of transmission. Testimony submitted to the Commission proposed data transmission such as computer-assisted instruction, touch-tone scoring signals, data retrieval and library reference service--any form of modulation that could be contained within the bandwidth.

The Commission, in its First Report and Order on Docket No. 18346, released July 15, 1969, authorized only the voice transmission response stations requested in the Stanford proposal. The decision was based on the fact that "the comments proposing uses other than voice talk-back were not specific as to the purpose and need for such additional uses, and in some cases we were unable to determine whether such uses would be consistent with the objectives of the proposed rules."[1] Specific information was not immediately available concerning the bandwidth requirements of the other types of data transmission proposed in testimony. In order to facilitate the development of the Stanford project, the Commission issued its Report and Order authorizing talk-back systems only.

---

[1] Ibid., p. 2.

At the same time, however, in a Further Notice of Proposed Rule Making, the Commission sought comments and specific data from interested parties on other possible types of transmission that might be authorized. Several of the respondents submitting testimony on Docket No. 18346 stressed the importance of flexibility of regulations in order to encourage development of new techniques. Norwood, for example, expressed his concern that the Commission avoid limitation that might inhibit the future development of ITFS:

> I do not believe that the Commission should limit its consideration to proposed systems which can currently be described in detail. To do so would be to constrict the range of technological alternatives unduly; and to discourage the development of new and potentially useful response systems.
>
> Rather, I suggest that the Commission should do all that it can to encourage the development of new devices by permitting the use of any system of ITFS response which can operate within the technical parameters already established, and without undue interference with presently authorized transmissions. Beyond that, I believe that the Commission should be open-minded toward any future proposals which would require such modifications as changes in modulation or bandwidth, and be willing to authorize such proposals under experimental conditions.
>
> The possibility, for example, of digital, push-button, response systems appears to hold the promise of increasing the number of reporting response stations through the use of narrowband transmission, and to allow, perhaps, every student in the viewing classrooms to respond

> at once, rather than only one student who speaks into the microphone. Clearly, the potentials of the technology are not yet well enough known to permit the "freezing" of standards at this time. The effect of such action would only be to discourage new developments and to minimize our options.[1]

Norwood further recommended that "on a pro-tem basis ... the Commission should make not only this 4 MHz band at the top of the ITFS spectrum available, but should consider applications for experimental use of any 4 MHz portion of the ITFS range in those localities where such experimentation would not inhibit or restrict the growth of ITFS."[2]

The majority of the testimony submitted merely supported the authorization of various types of transmission. I.B.M., however, outlined several specific applications of response systems:

> (IBM) points out that although many school systems use data processing for administrative tasks, many also use these techniques to perform such teacher tasks as test scoring and preparation of reports and attendance records. It is said that many of these schools are seeking ways of adopting these techniques to the teaching process itself, and that IBM is currently involved in the research and development of ways to use data processing technology in the teaching process.... It suggests that the scoring signals could be stored at the classroom as the students reply to the testing and instruction process, and that when the instructor wishes the results, the command signals to trigger the transmission of these signals could be sent on the video carrier during the

---

[1] Letter, Frank Norwood to Dr. Robert L. Hilliard, Executive Vice Chairman, Committee on the Full Development of ITFS, August 6, 1969.

[2] *Ibid.*

> vertical retrace time. IBM further states that data signals at the rate used for ITFS response systems applications require no more bandwidth than voice signals, and the adoption of the proposed amendment would not require any changes in the specifications of the authorized answer-back channels, nor the allocation of any additional frequencies.[1]

Based on the testimony presented, the Commission ruled in March 1970 that "there is a need for the use of data type transmissions on the talk-back channels and that the use of data and voice signals over these circuits would be a distinct advantage in the instruction process."[2] The ruling limits response channels to the 2686-2690 MHz range, but offers broad interpretation in terms of use. The Report and Order, released March 13, 1970, expresses the rationale of the Commission:

> The Commission does not intend to discourage any legitimate program of experimentation and does in fact encourage such programs. We will certainly entertain experimental/developmental applications by responsible parties that set forth a program looking forward to expanded uses and technical developments of this service, if they show a reasonable chance of furthering the state of the art.[3]

---

[1] Federal Communications Commission, Docket No. 18346, Second Report and Order, FCC 70-265, adopted March 11, 1970, pp. 2-3.

[2] *Ibid.*, p. 3.

[3] *Ibid.*, p. 2.

Expanded functions of the Committee

The implications of these new developments and the expanded responsibilities of the Committee for the Full Development of ITFS, are suggested by Commissioner H. Rex Lee in comments made to the February 27, 1970 meeting of the Committee in San Francisco:

> It has been suggested that maybe we ought to change the name of the committee. Maybe we ought to broaden its functions a bit and encompass what I think everyone is really thinking about, that is, we're talking more in terms of a complete service (to) education.
>
> Someone suggested that maybe we ought to call it the Instructional Communications Fixed Service. And this would encompass the things such as response station data, all kinds of data transmission used in education, computers, administrative uses, feedbacks of all kinds.... It has some appeal to me in terms of broadening the scope that the Committee has given me in terms of educational matters. I think that we need to be thinking in terms of every possible service that can assist education.[1]

---

[1] Official Report of Proceedings, February 27, 1970, p. 62.

PART II

Chapter VI

Graphic Description of ITFS Systems

Data pertaining to the development of ITFS systems are based primarily on the results of the survey of ITFS installations conducted as a part of the present study. This documentation is presented in this section in tabular and graphic form in order to support and complement the material presented in narrative form in Part I.

The following tables and figures graphically depict the development of ITFS systems, stations and channels now on the air. As indicated, the distinction between systems, stations and channels is necessary in order to achieve an accurate conception of the scope of individual systems and of the national growth of ITFS. Because of ambiguity concerning the definition of the term "station", the division in Part II is generally limited to the more precise divisions of systems and channels.

Growth of ITFS

Table I shows the numbers of systems, stations and channels activated each year, 1964-1970, indicating both annual and cumulative growth. Table II shows this growth pattern in terms of types of systems. This division by type of system is designed to provide a more accurate statistical description of each of the major types of systems which, as stated in Part I, vary greatly in basic design and purpose.

Figures 1 through 3 plot graphically the growth of ITFS stations, channels and systems on the air. The horizontal time line is divided by months and year, September 1964 through April 1970. The total number of systems, stations and channels is represented by the heavy black line; broken lines depict the growth in terms of types of systems.

In the latter division by type of system the Cleveland consortium, which includes various types of institutions in a unique organization structure, is not included in the statistics. The Bradley University system, which serves not the university but public and parochial schools, is represented for statistical purposes as a public school system.

Table I

Annual and Cumulated Growth of ITFS Systems, Stations, Channels

1964-1970

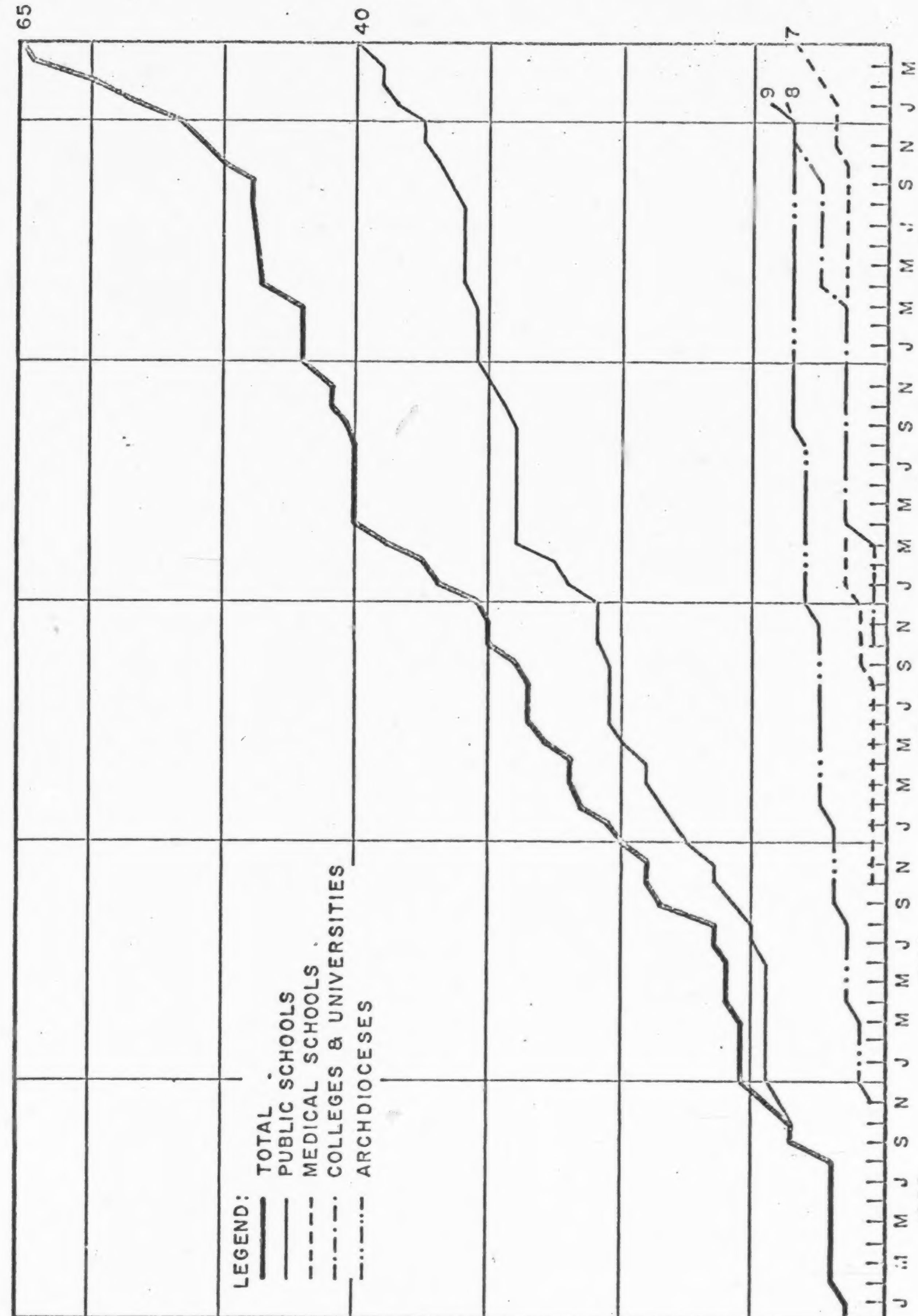
Year	SYSTEMS Annual Growth	SYSTEMS Cumulative Growth	STATIONS Annual Growth	STATIONS Cumulative Growth	CHANNELS Annual Growth	CHANNELS Cumulative Growth
1964	3	3	3	3	4	4
1965	8	11	8	11	15	19
1966	9	20	16	27	52	71
1967	11	31	18	45	39	110
1968	13	44	34	79	73	183
1969	9	53	22	101	55	238
1970	12	65	19	120	51	290

Table II

Annual Growth of ITFS Systems: Five Major Types of Systems

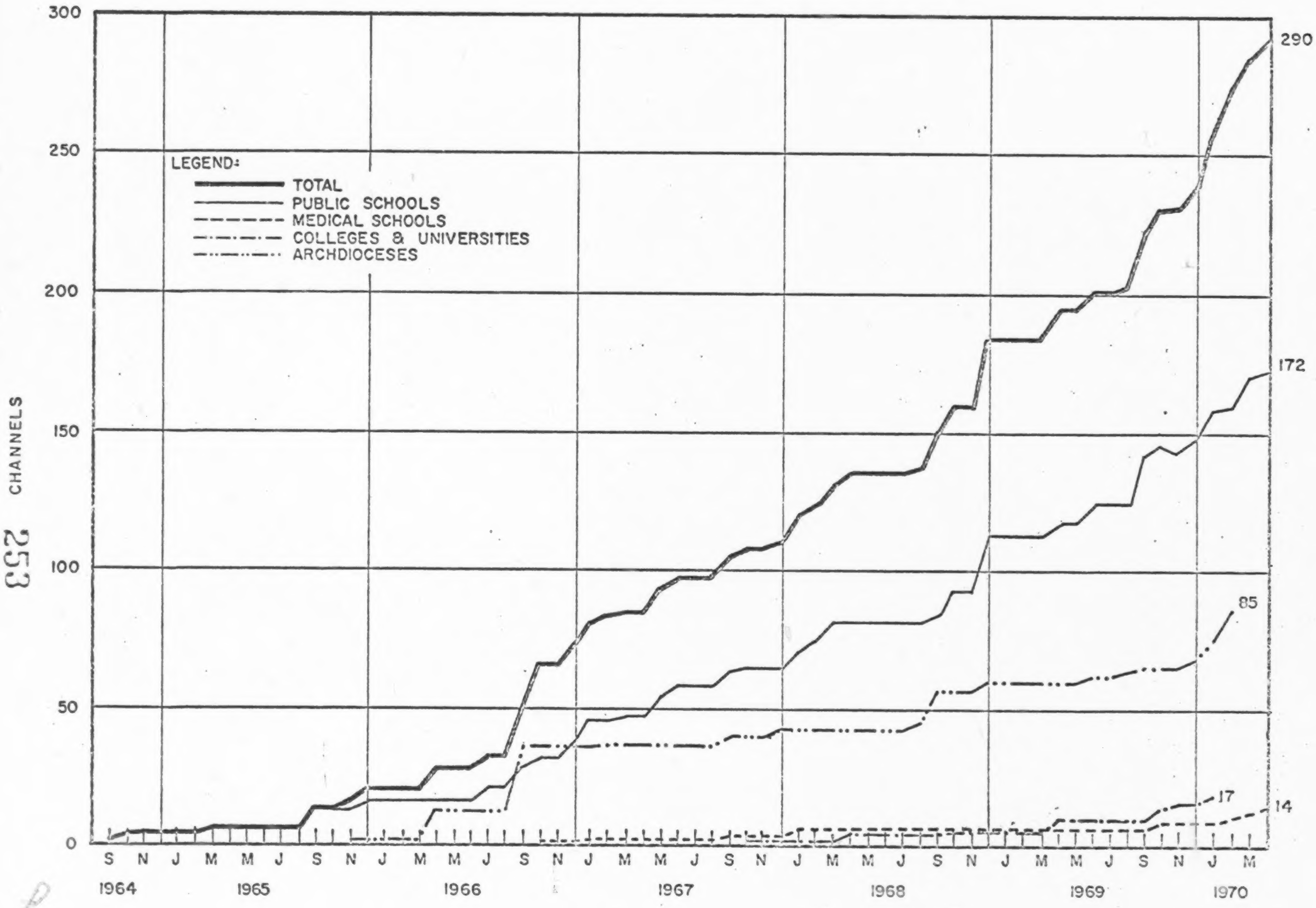
	Public Schools		Medical		College		Dioceses		Consortium	
Year	Sys.	Chans.	Sys.	Chans.	Sys.	Chans.	Sys.	Chans.	Sys.	Chans.
1964	3	4								
1965	9	16					2	3		
1966	15	37	1	1			4	33		
1967	22	64	2	3	1	2	6	41		
1968	31	112	3	6	3	6	7	59		
1969	35	148	4	8	7	15	7	67		
1970	40	172	7	14	8	17	9	85	1	2

SYSTEMS ON THE AIR

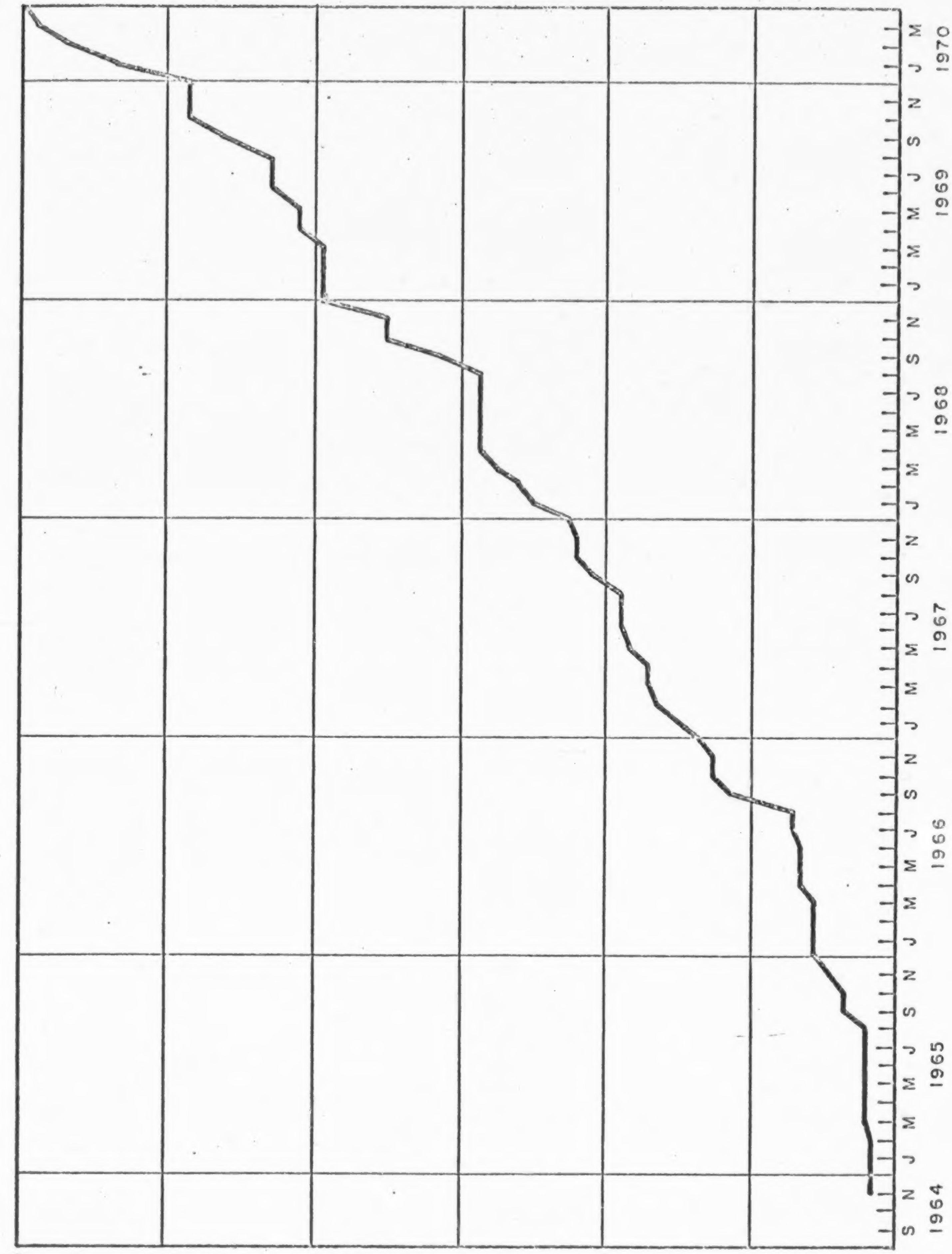


[Figure 1]

CHANNELS ON THE AIR



STATIONS ON THE AIR



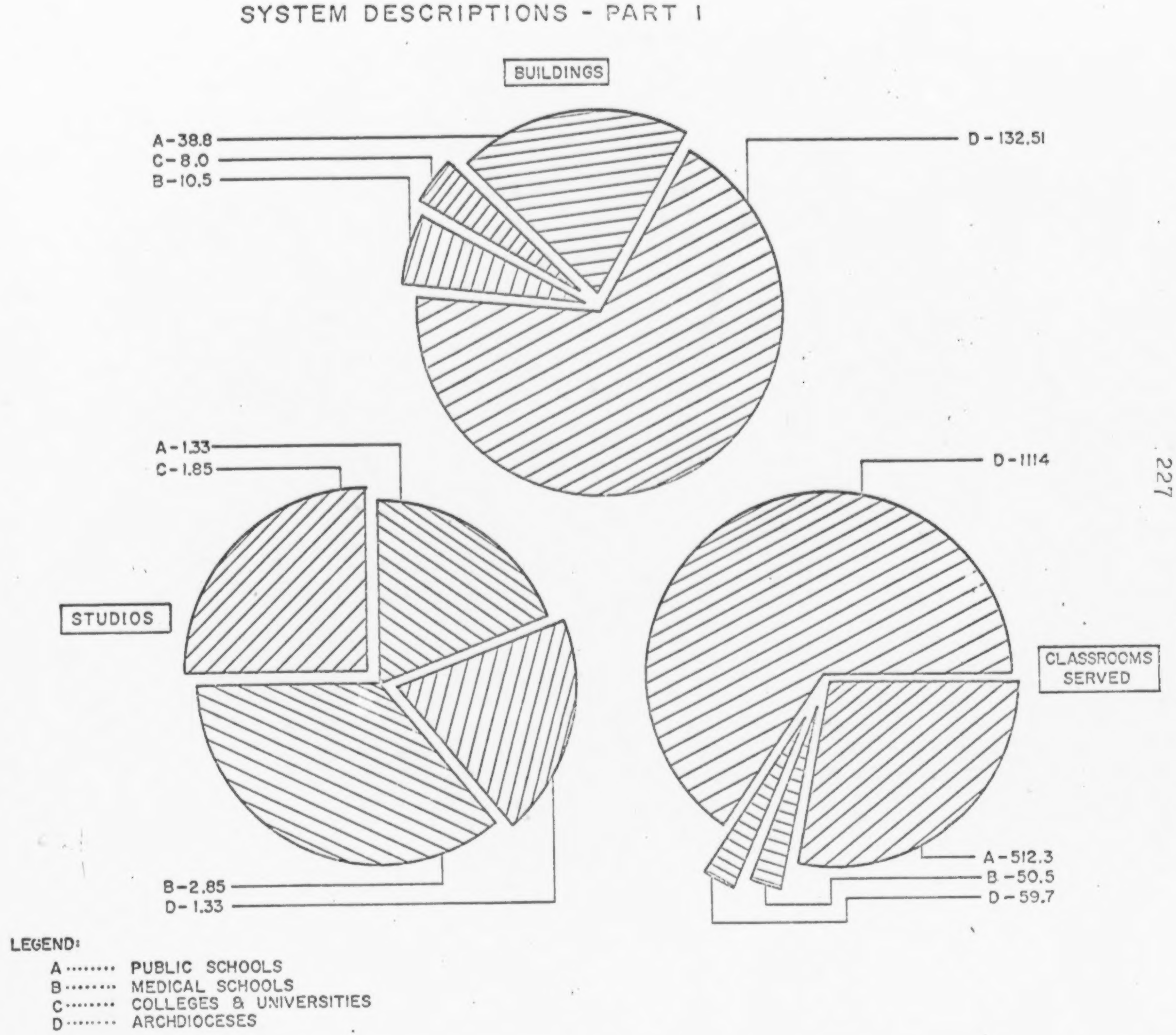
[Figure 3]

Description of ITFS Systems

Figures 4 through 7 describe graphically the size, range and design of the four types of ITFS systems. Figures 4 and 5 represent the average numbers of buildings, classrooms and students served, the average radius in miles, the average hours of programming per week, and the average numbers of production studios maintained by each type of system.

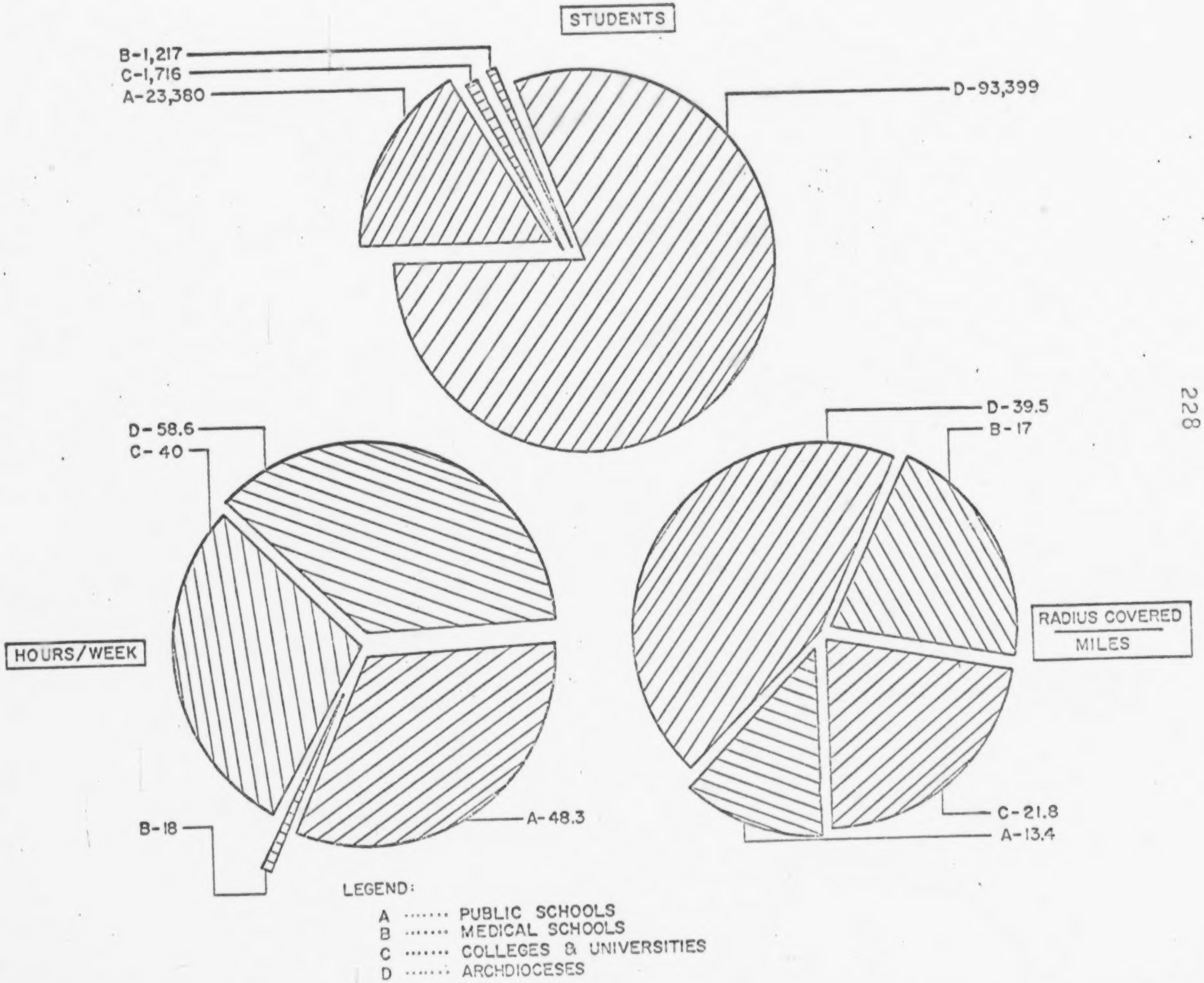
Figure 6 indicates the average number of down converters owned by ITFS systems. This statistic represents also the number of buildings, instructional or other, receiving the ITFS signal. Again, in order to depict the relative size of each type of system, the average number of down converters is divided according to type of system.

Figure 7 depicts the kind and amount of studio equipment owned by ITFS systems. Respondents were requested to indicate the numbers of each item listed on the questionnaire form. The average number per system is represented on the charts. A more comprehensive representation of individual system design in found in Chapter IX which provides statistical profiles of each of the 65 ITFS system on the air.

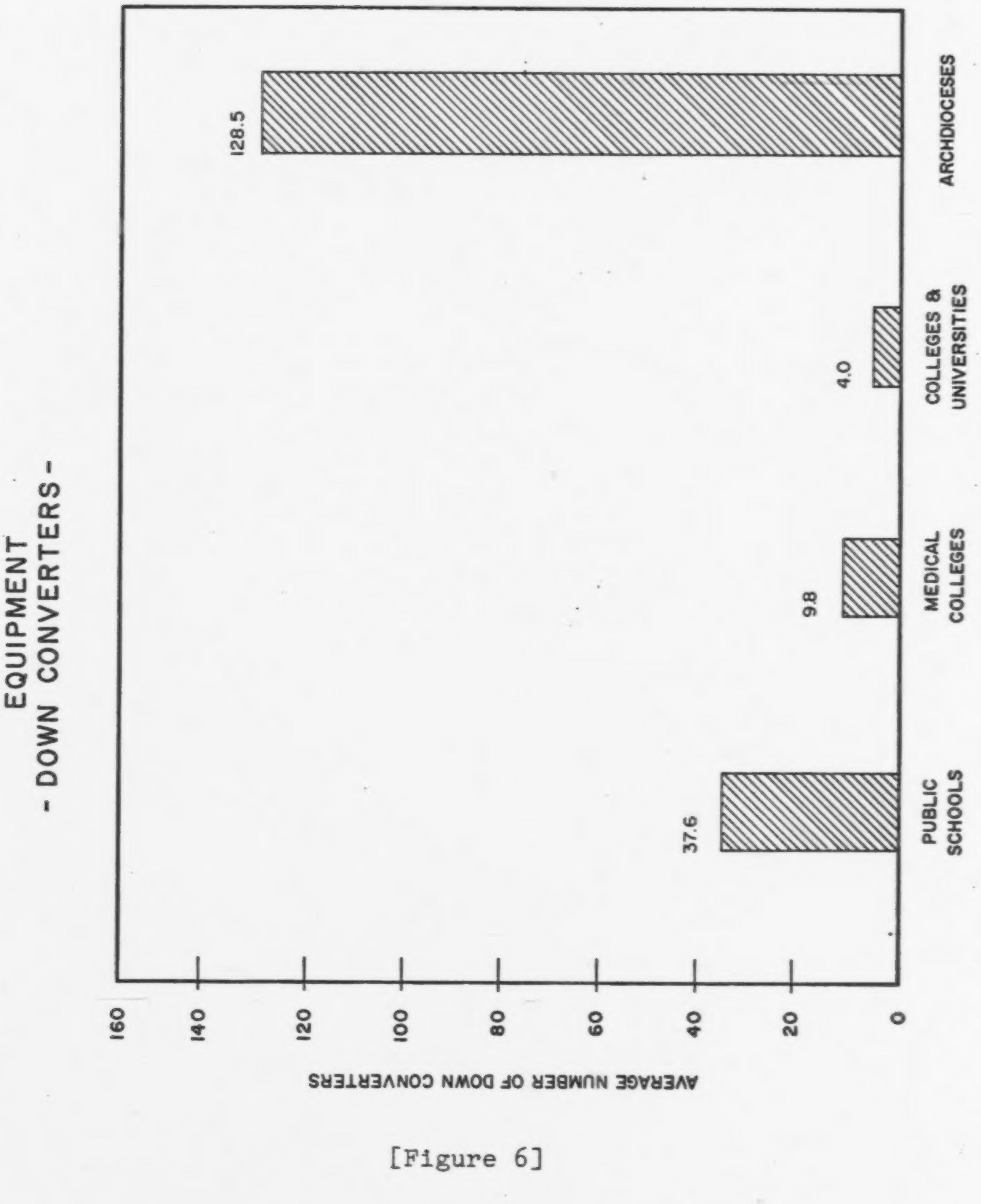

SYSTEM DESCRIPTIONS - PART I
BUILDINGS
A-38.8
C-8.0
B-10.5
D-132.51
STUDIOS
A-1.33
C-1.85
B-2.85
D-1.33
CLASSROOMS SERVED
D-1114
A-512.3
B-50.5
D-59.7
LEGEND:
A PUBLIC SCHOOLS
B MEDICAL SCHOOLS
C COLLEGES & UNIVERSITIES
D ARCHDIOCESES

[Figure 4]

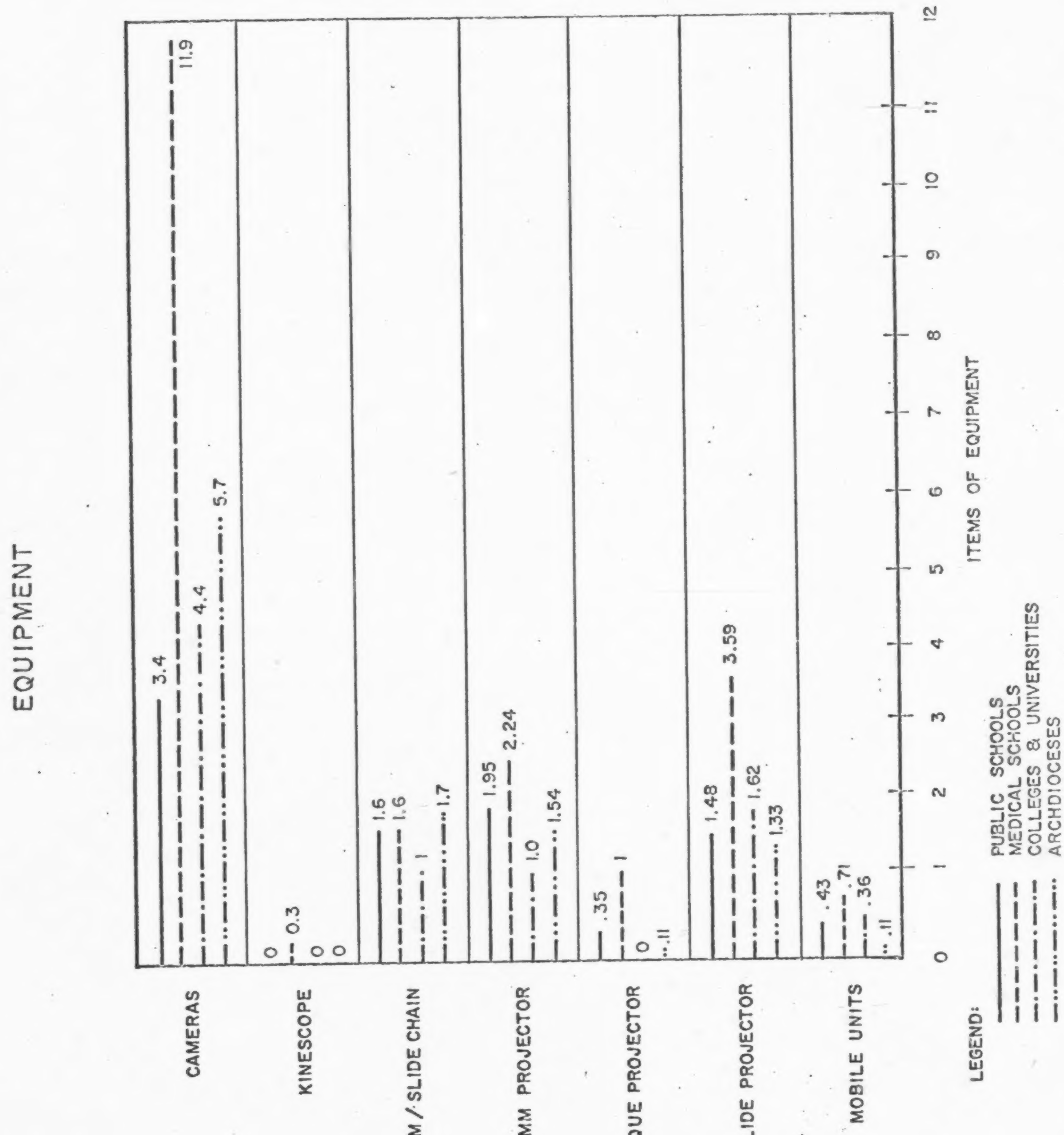
SYSTEM DESCRIPTIONS - PART 2



[Figure 5]


EQUIPMENT
- DOWN CONVERTERS -
AVERAGE NUMBER OF DOWN CONVERTERS
0
20
40
60
80
100
120
140
160
37.6
PUBLIC SCHOOLS
9.8
MEDICAL COLLEGES
4.0
COLLEGES & UNIVERSITIES
128.5
ARCHDIOCESES

[Figure 6]


EQUIPMENT
CAMERAS
3.4
11.9
4.4
5.7
KINESCOPE
0
0.3
0
0
FILM / SLIDE CHAIN
1.6
1.6
1
1.7
16MM PROJECTOR
1.95
2.24
1.0
1.54
OPAQUE PROJECTOR
.35
1
0
.11
SLIDE PROJECTOR
1.48
3.59
1.62
1.33
MOBILE UNITS
.43
.71
.36
.11
0
1
2
3
4
5
6
7
8
9
10
11
12
ITEMS OF EQUIPMENT
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

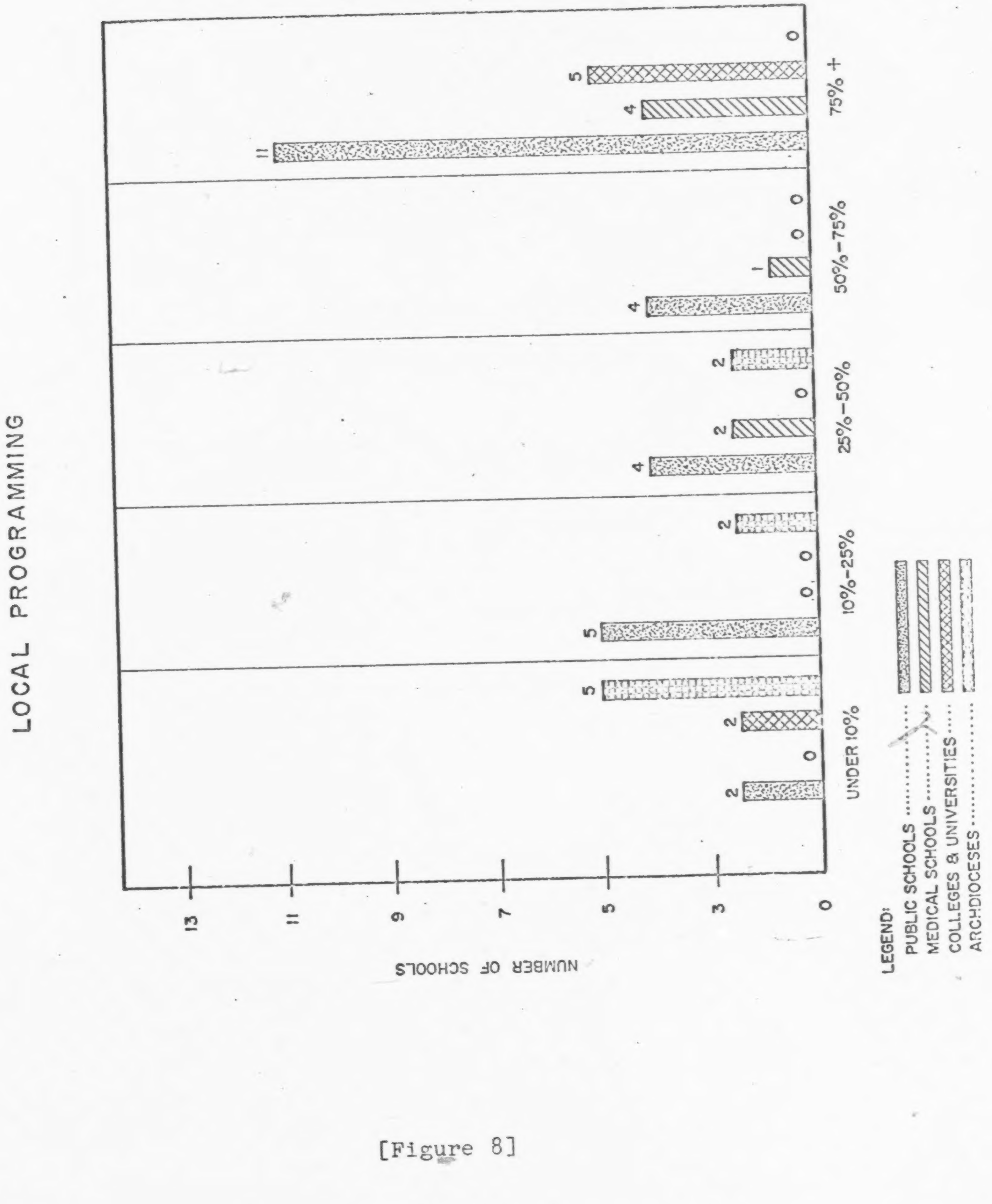
[Figure 7]

Programming

Figures 8 through 12 pertain to utilization of ITFS by the various types of systems. Figures 8 and 9 depict graphically the amount of local programming developed and used by the four types of systems. Figure 8 describes the numbers of institutions indicating a specified percentage of local programming; Figure 9 indicates the percentage of each type of institution engaging in local programming.

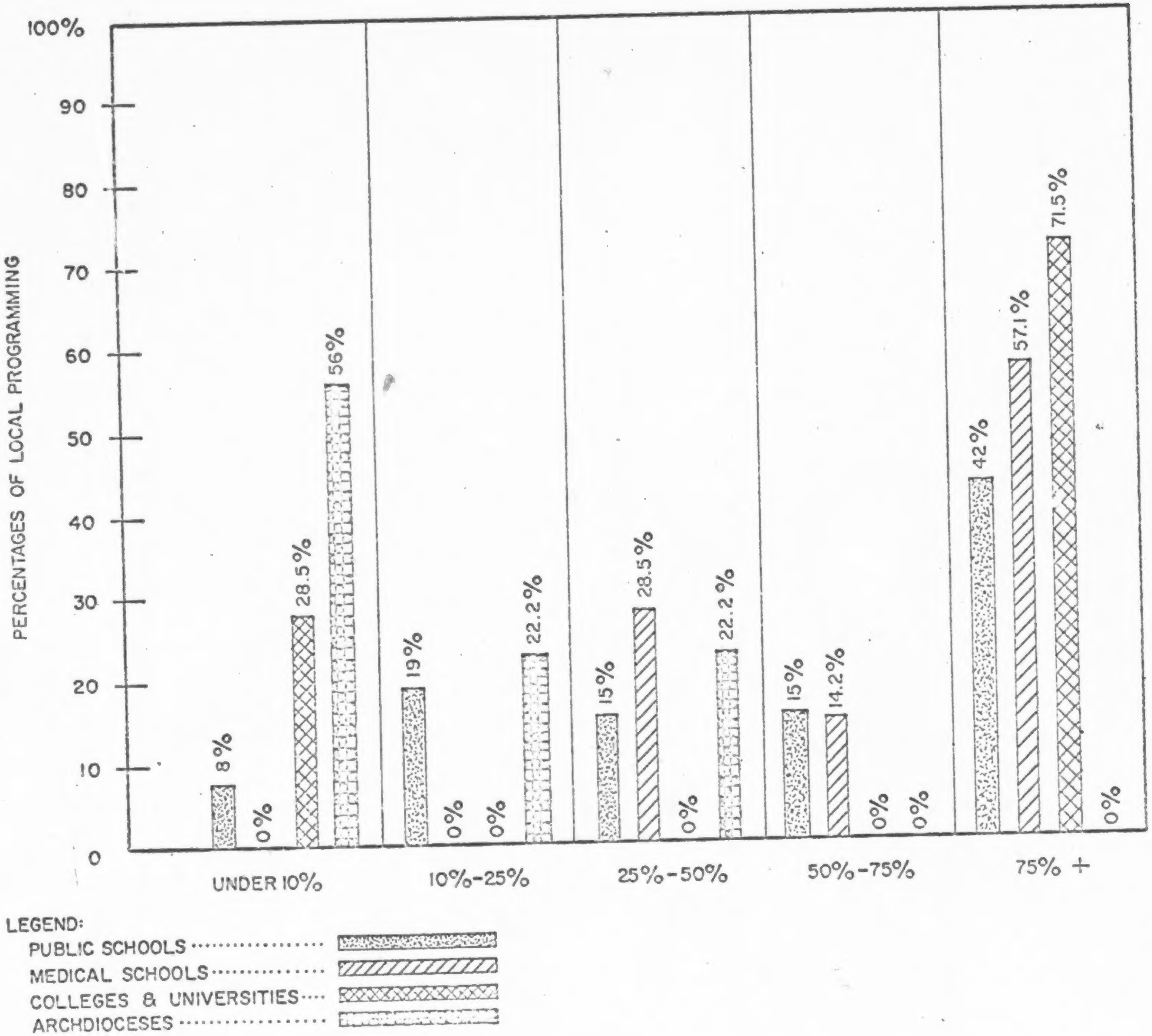
The survey questionnaire listed a variety of types of programming in which instructional television systems might participate. Figures 10 and 11 depict the percentage of respondents indicating participating in the various types of programming. See the survey questionnaire in Appendix I for a more complete definition of the types of programming listed.

Several institutions employ wired internal distribution systems to complement ITFS distribution. In many instances, particularly at the higher education level, extensive CCTV systems are relayed by means of ITFS to remote locations. School systems employ multi-channel internal distribution systems to meet local scheduling problems. Figure 12 depicts the percentage of each type of system which videotape off the air from ITFS channels for redistribution on internal distribution systems.

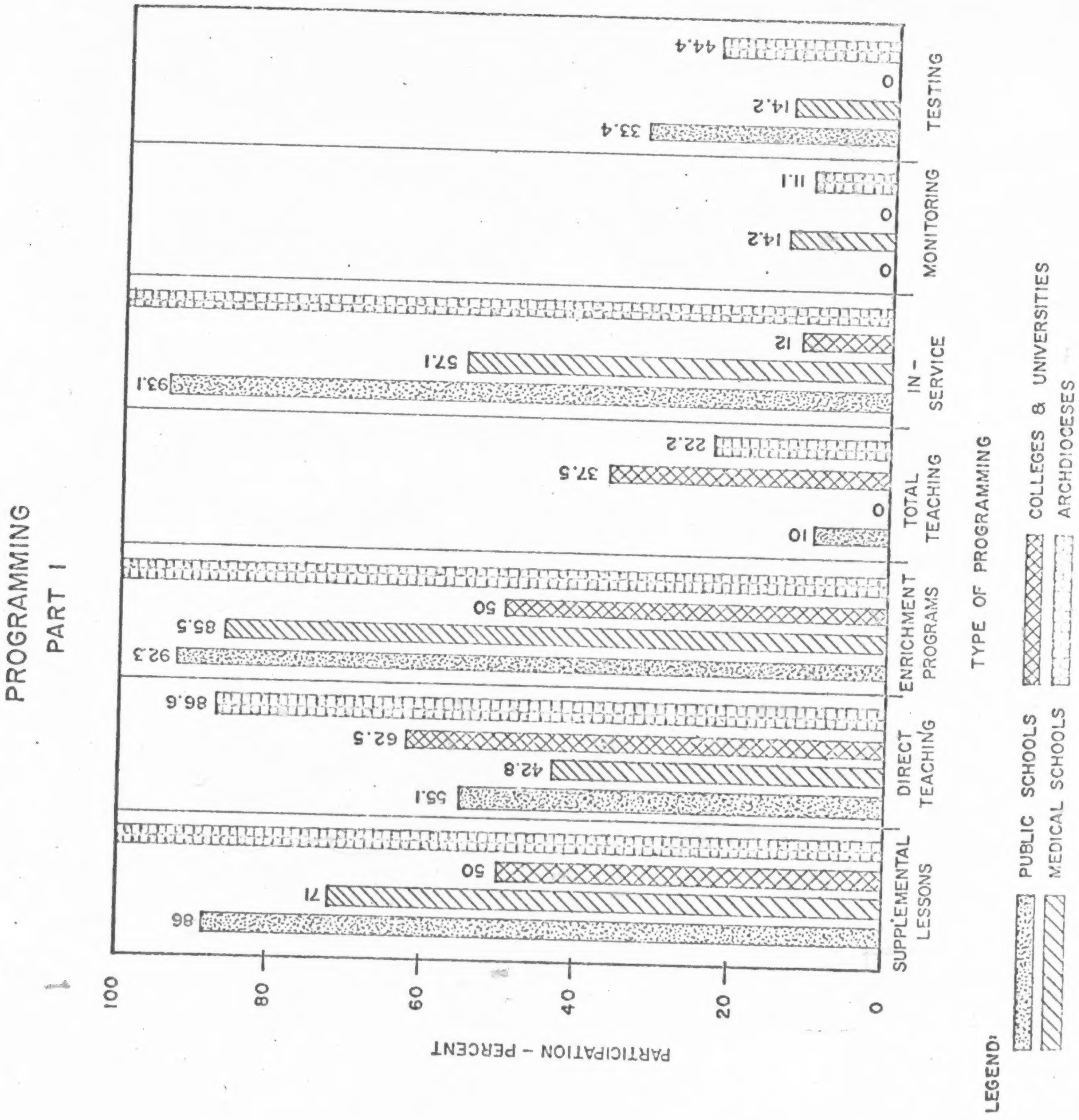

LOCAL PROGRAMMING
NUMBER OF SCHOOLS
0
3
5
7
9
11
13
UNDER 10%
10%-25%
25%-50%
50%-75%
75% +
2
0
2
5
5
0
0
2
4
2
0
2
4
1
0
0
11
4
5
0
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

[Figure 8]

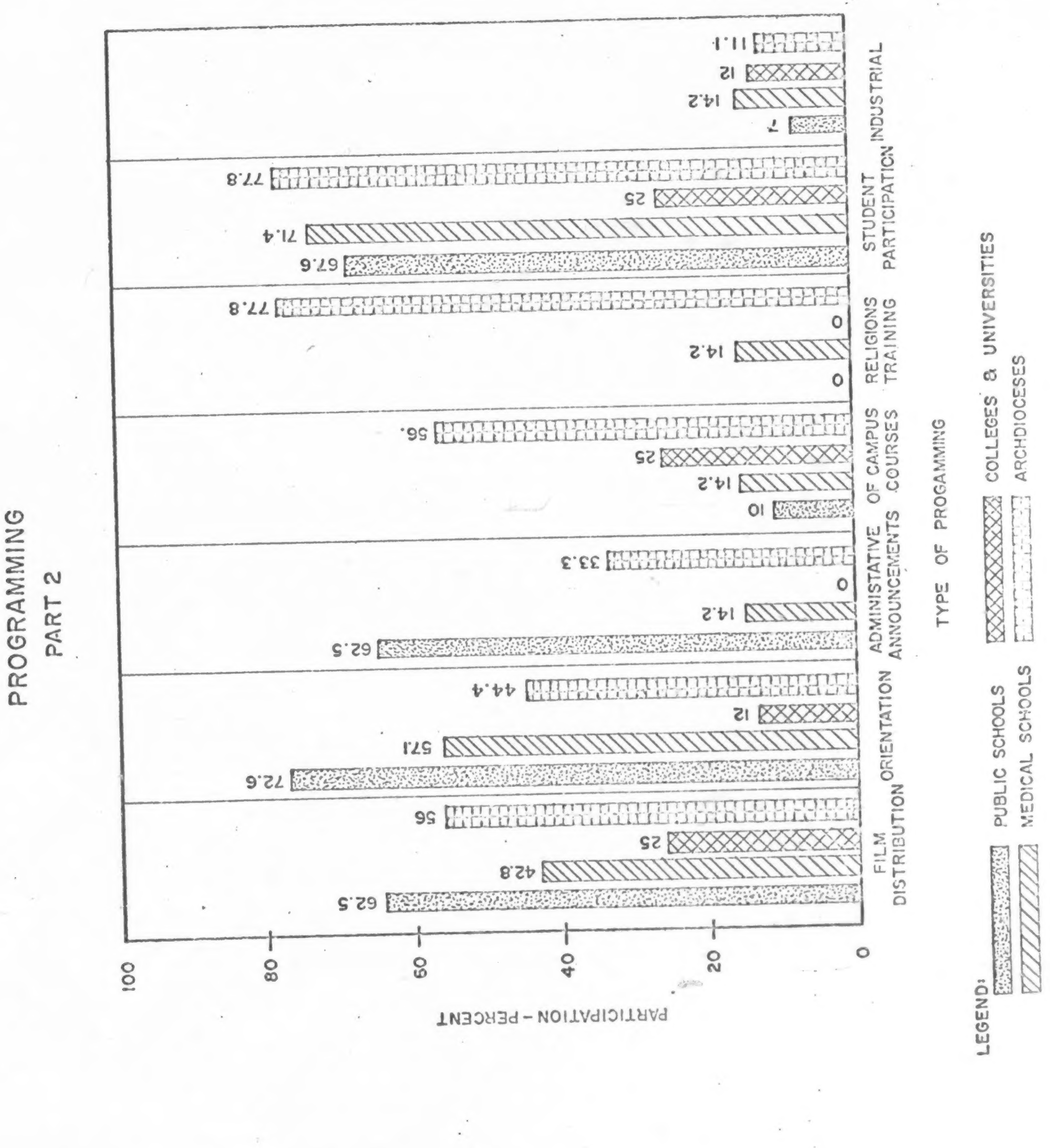
PERCENTAGE OF LOCAL PROGRAMMING



[Figure 9]


PROGRAMMING
PART I
PARTICIPATION - PERCENT
0
20
40
60
80
100
SUPPLEMENTAL LESSONS
86
71
50
DIRECT TEACHING
55.1
42.8
62.5
86.6
ENRICHMENT PROGRAMS
92.3
85.5
50
TOTAL TEACHING
10
0
37.5
22.2
IN - SERVICE
93.1
57.1
12
MONITORING
0
14.2
0
11.1
TESTING
33.4
14.2
0
44.4
TYPE OF PROGRAMMING
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

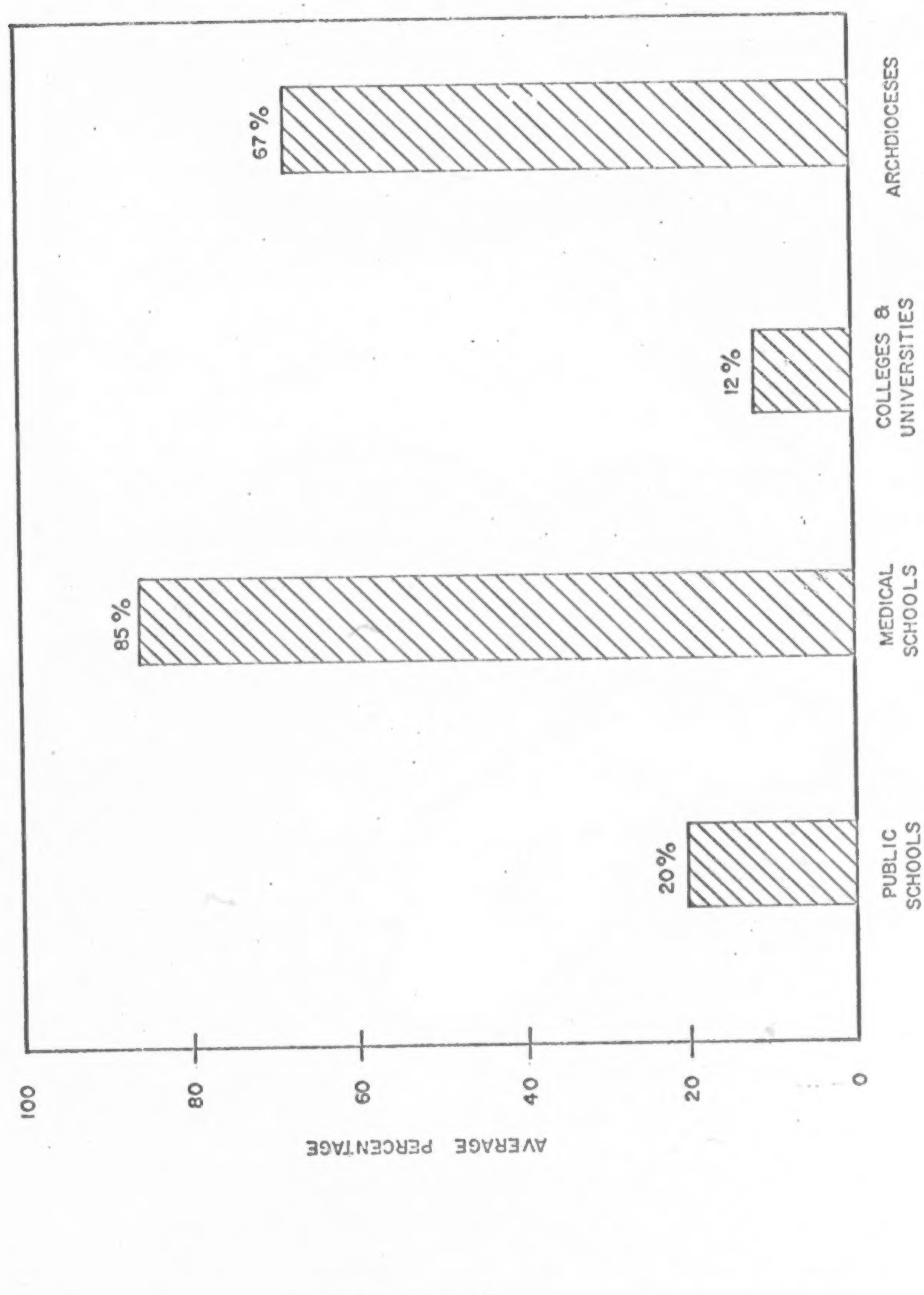
[Figure 10]



PROGRAMMING
PART 2

[Figure 11]

VIDEOTAPE FOR REDISTRIBUTION OVER CCTV



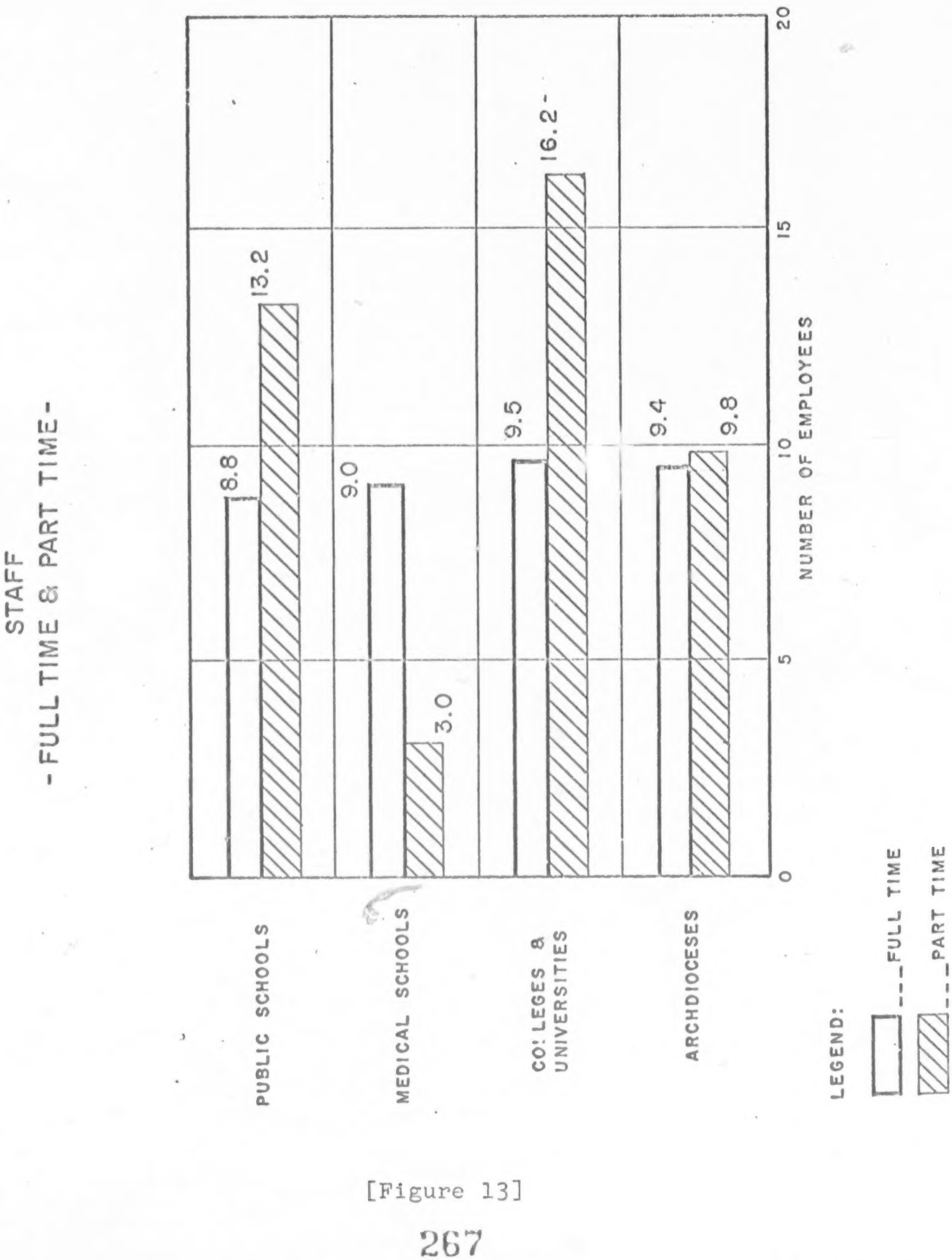
[Figure 12]

Staff

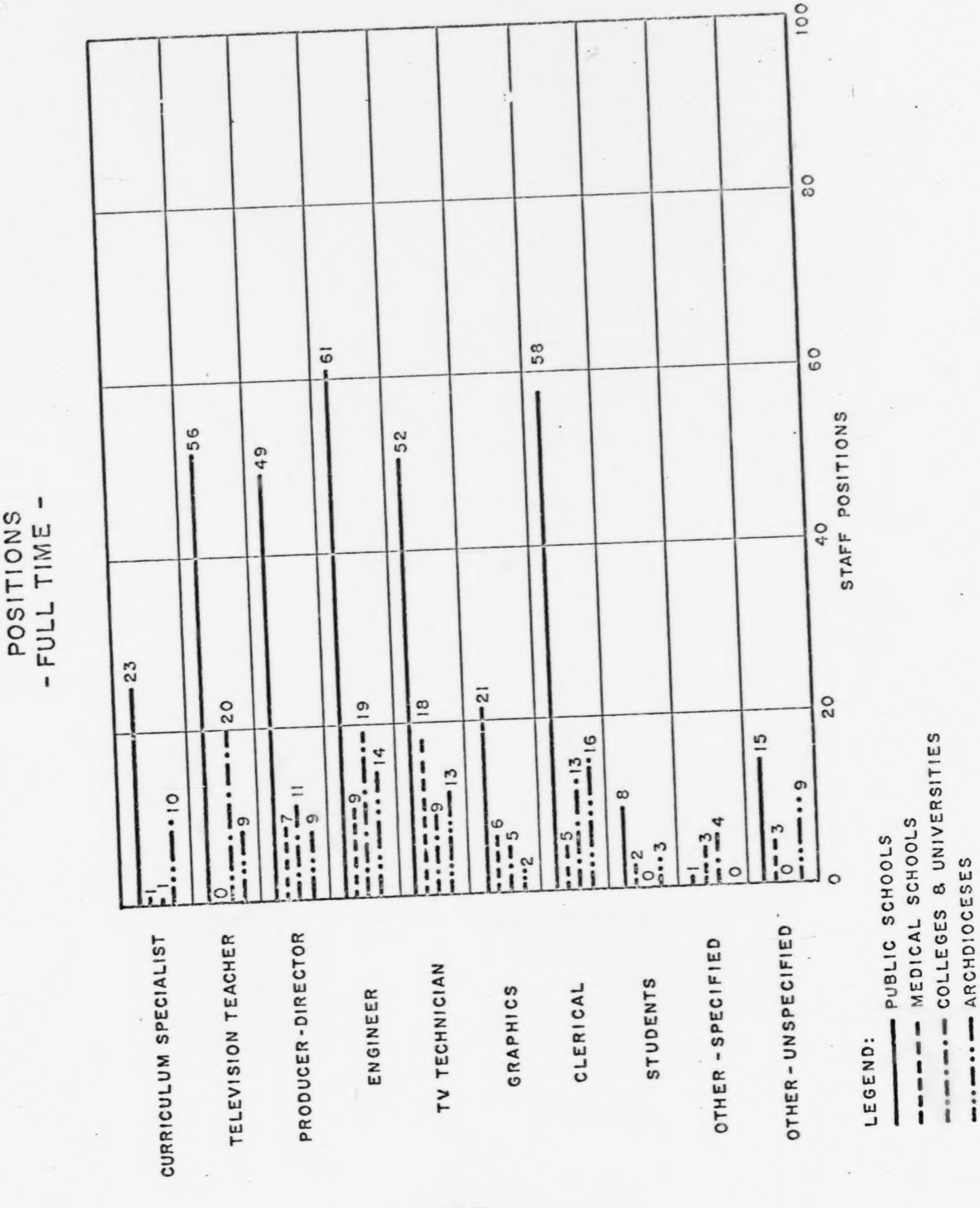
Figures 13 through 15 represent full and part-time staffing patterns of the various types of systems. Total numbers of employees, full and part-time, are described in Figure 13. The figure represents the average total number of employees according to type of system.

Figures 14 and 15 represent staffing patterns according to position, as listed in the survey questionnaire. In these instances it is the total number of employees rather than the average number that is portrayed. It should be noted that in some instances the total number of part-time employees does not correspond with the number of part-time employees by position. The reasons is that, if one employee works full-time, part-time in each of several positions, he may be listed more than once as a part-time employee under the specific positions he fills. He would not, however, be listed more than once in the totals of part-time employees.

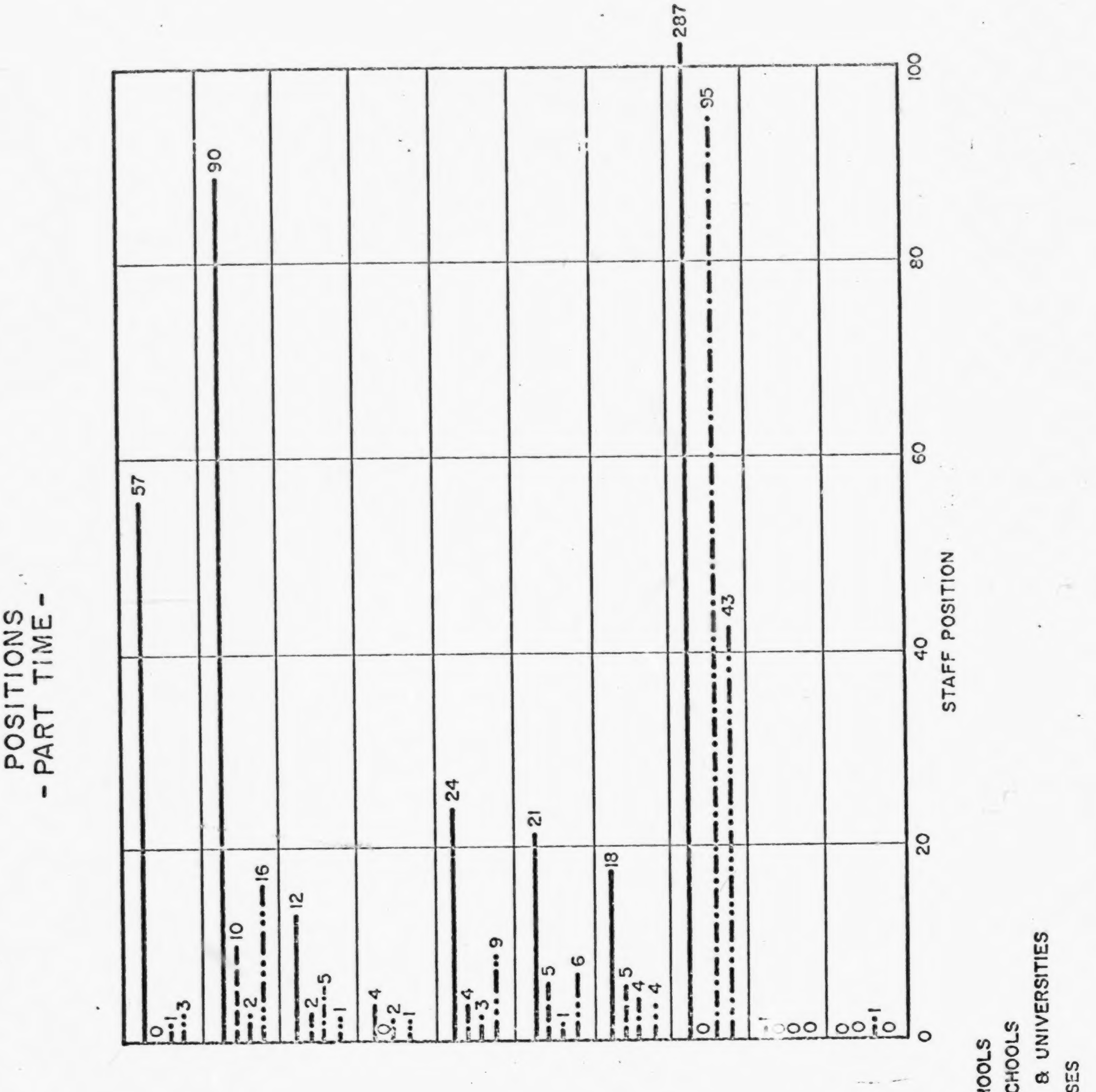
For a more complete description of the ataffing of individual systems, see the statistical profiles in Chapter IX of this study, page 257.


STAFF
-FULL TIME & PART TIME-
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES &
UNIVERSITIES
ARCHDIOCESES
8.8
13.2
9.0
3.0
9.5
16.2
9.4
9.8
0
5
10
15
20
NUMBER OF EMPLOYEES
LEGEND:
FULL TIME
PART TIME

[Figure 13]


POSITIONS
- FULL TIME -
CURRICULUM SPECIALIST
23
1
1
10
TELEVISION TEACHER
56
20
0
9
PRODUCER-DIRECTOR
49
7
11
9
ENGINEER
61
19
9
14
TV TECHNICIAN
52
18
9
13
GRAPHICS
21
6
5
2
CLERICAL
58
5
13
16
STUDENTS
8
2
0
3
OTHER - SPECIFIED
1
3
0
4
OTHER - UNSPECIFIED
15
3
0
9
0
20
40
60
80
100
STAFF POSITIONS
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

[Figure 14]


POSITIONS
- PART TIME -
CURRICULUM SPECIALIST
TELEVISION TEACHER
PRODUCTION DIRECTOR
ENGINEER
TV TECHNICIAN
GRAPHICS
CLERICAL
STUDENTS
OTHER - SPECIFIED
OTHER - UNSPECIFIED
57
0
1
3
90
10
2
16
12
2
5
1
4
0
2
1
24
4
3
9
21
5
1
6
18
5
4
4
287
0
95
43
0
0
0
0
0
1
0
0
20
40
60
80
100
STAFF POSITION
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

[Figure 15]

Budget

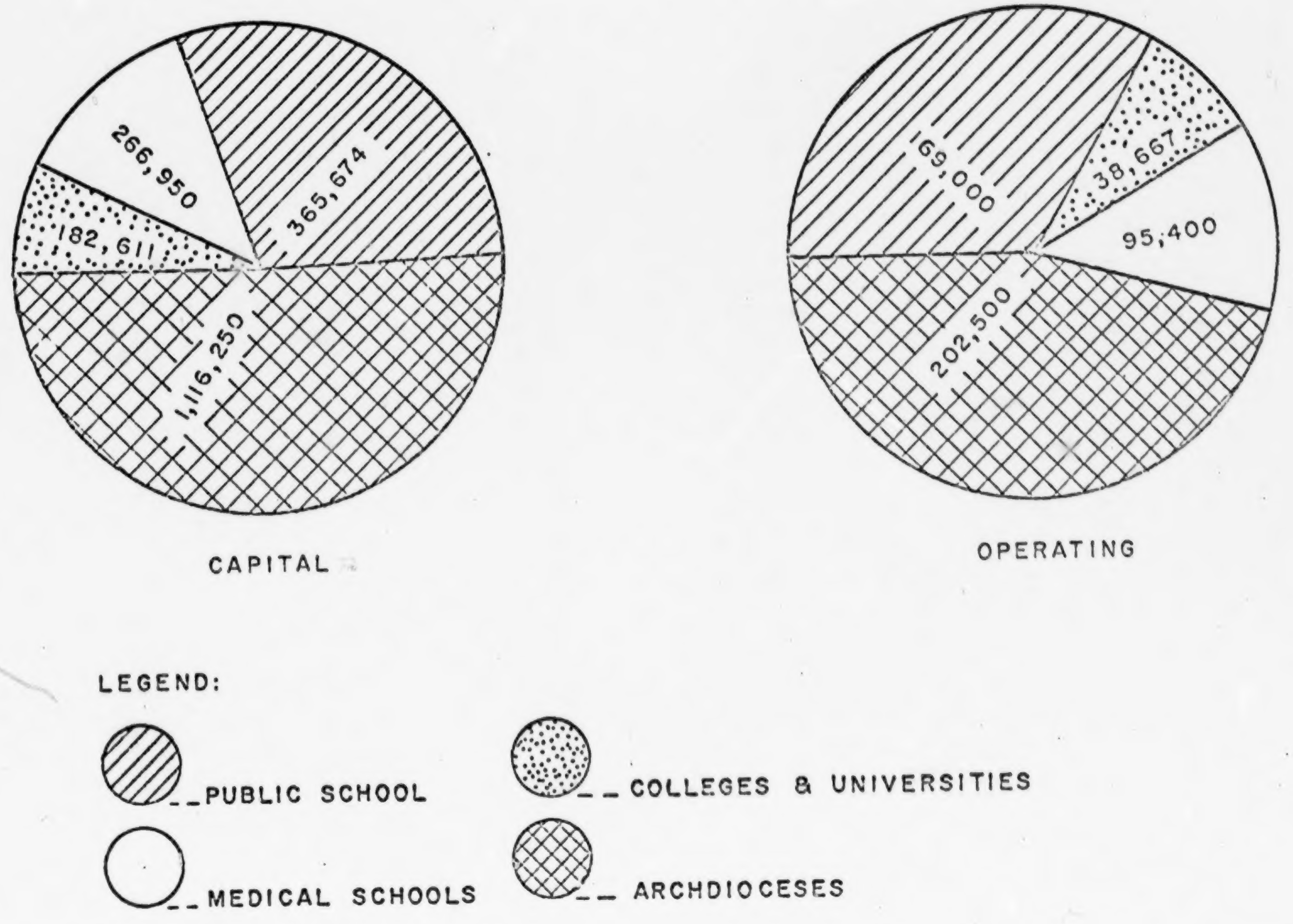
Figures 16 through 18 pertain to the amount and sources of funding for ITFS. Figure 16 indicates the total amounts of capital and operating budgets for each of the four types of ITFS systems.

Figures 17 and 18 indicate the sources of these funds. Figure 17 depicts the number of each type of system which received financial support for capital expenditures from the sources listed: federal government, state government, local government, community (non-government), archdiocese or parish, college or university.

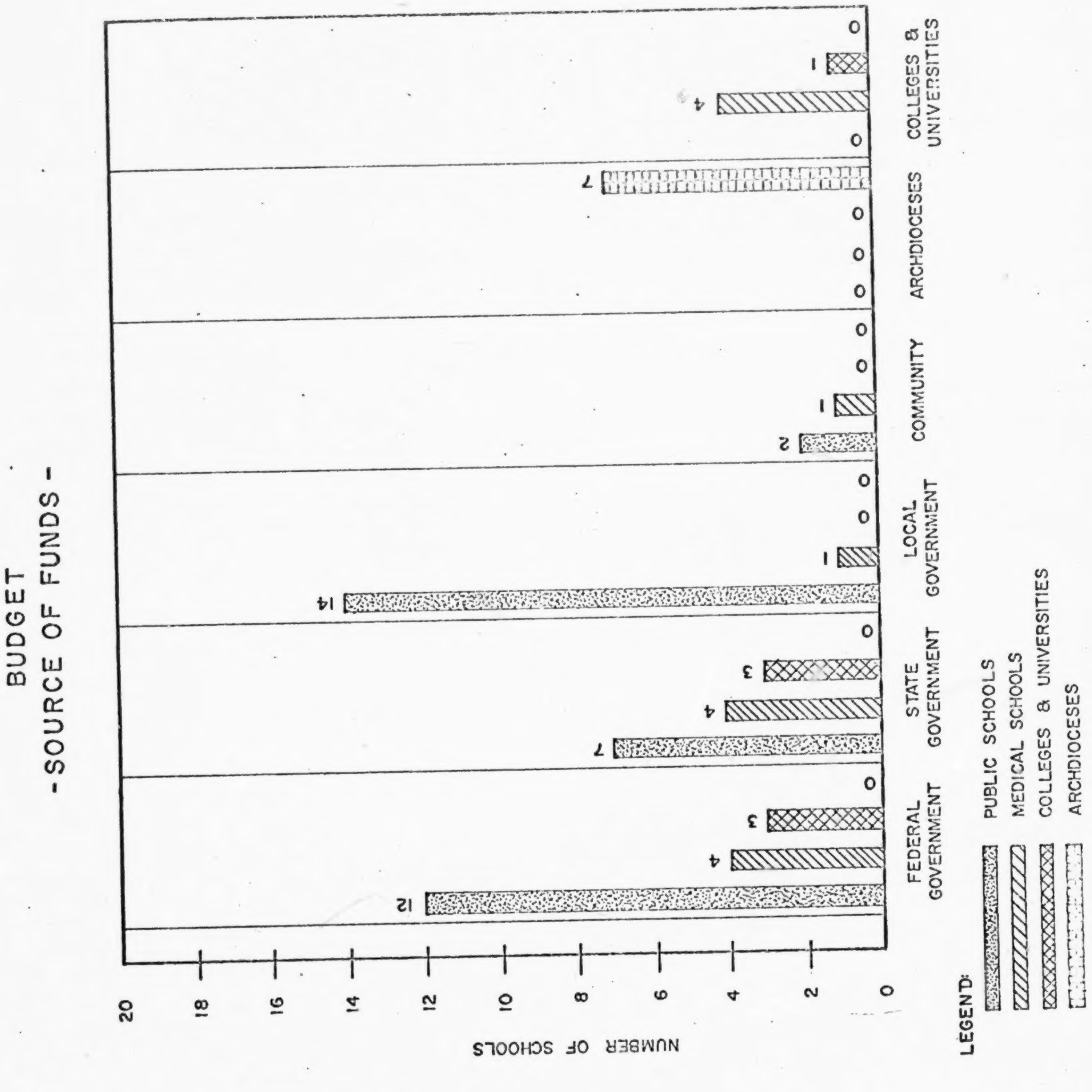
Figure 18 describes the number of institutions receiving funds for operating expenditures from each of these sources listed.

Again, for a more complete representation of the budgets of individual systems, consult the statistical profiles in Chapter IX, page 257 of this study.

BUDGETS
CAPITAL & OPERATING

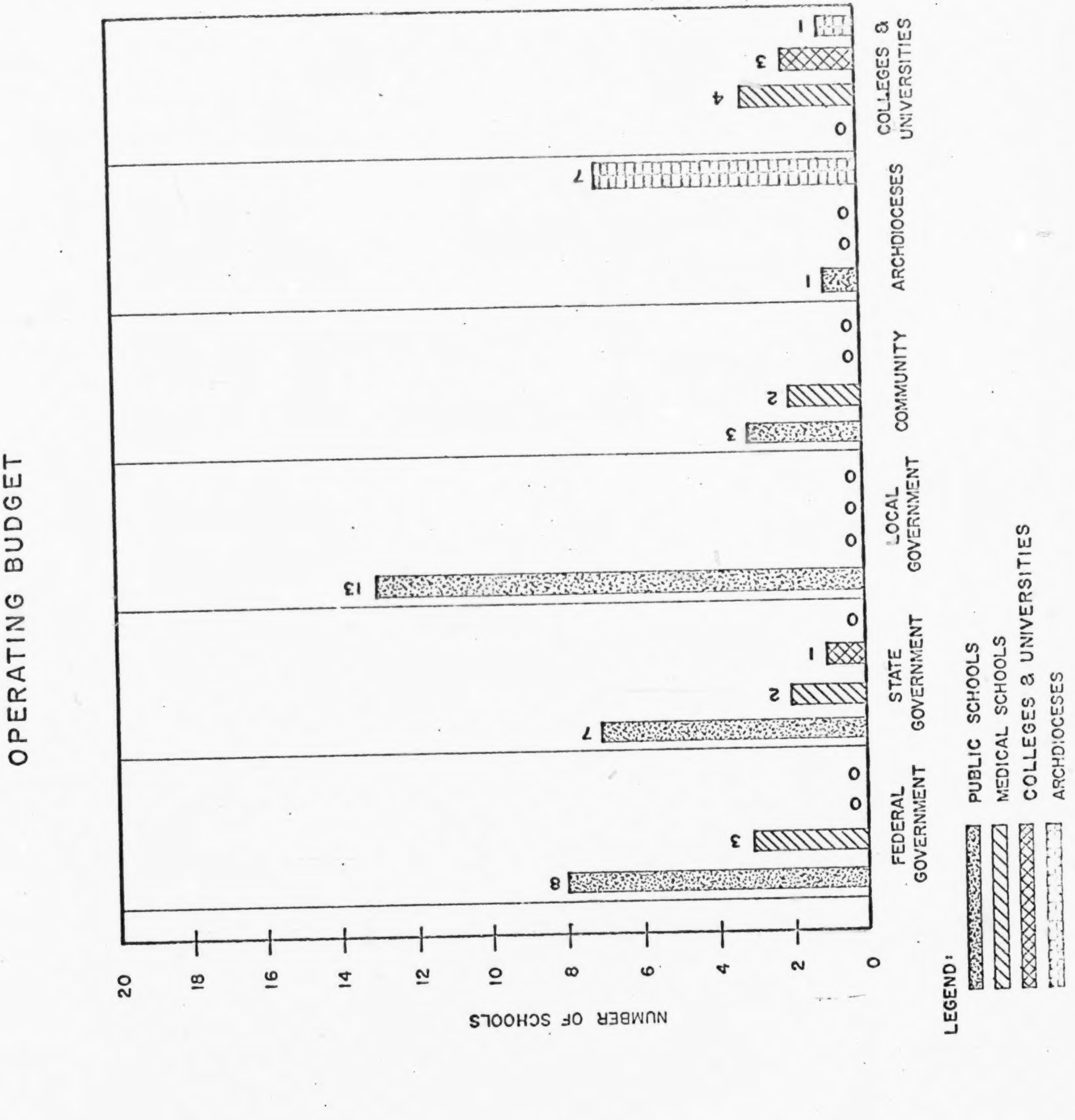


[Figure 16]



BUDGET
- SOURCE OF FUNDS -

[Figure 17]


OPERATING BUDGET
NUMBER OF SCHOOLS
0
2
4
6
8
10
12
14
16
18
20
FEDERAL GOVERNMENT
8
3
0
0
STATE GOVERNMENT
7
2
1
0
LOCAL GOVERNMENT
13
0
0
0
COMMUNITY
3
2
0
0
ARCHDIOCESES
1
0
0
7
COLLEGES & UNIVERSITIES
0
4
3
1
LEGEND:
PUBLIC SCHOOLS
MEDICAL SCHOOLS
COLLEGES & UNIVERSITIES
ARCHDIOCESES

[Figure 18]

Chapter VII

Identified ITFS Systems on the Air

Following is a list of the persons responsible for the ITFS systems currently on the air. Unless otherwise indicated, the person listed below was also responsible for completing the survey questionnaire:

System Number — Name, Title, Address

1 Frank Martin
Facilities Director
Birmingham School System
2015 7th Avenue North
Birmingham, Alabama 35202

2 Gerald E. Godfrey
Director, Instructional Television
Jefferson County Board of Education
A-400 Courthouse Building
Birmingham, Alabama 35203

3 Billy J. Rains
Director of Instruction
Etowah County Board of Education
Gadsden, Alabama 35902

4 David W. Marxer
Director of Educational Media
Huntsville Public Schools
Huntsville, Alabama 35804

5 Allen Cuppy
Director, Department of Instructional Media
Anaheim City School District
Anaheim, California 92805
Questionnaire completed by Merlyn D. Rawson, Chief Engineer

6 Ernest A. Poore
Superintendent of Schools
Fresno County Department of Education
2314 Mariposa Street
Fresno, California 93721
Questionnaire completed by Harriett Jowett, Coordinator, Compensatory Education, and Chairman, ITV Program Committee

System Number	Name, Title, Address
7	Allen Cuppy Director, Department of Instructional Media Anaheim City School District Anaheim, California 92805 Questionnaire completed by Merlyn D. Rawson, Chief Engineer
8	Dr. Frank B. George Director, Instructional Resources Long Beach Unified School District 201 East 8th Street Long Beach, California 90813
9	Reverend John C. Urban Director, Radio and Television Department of Communications Archdiocese of Los Angeles Education and Welfare Corporation 1531 West Ninth Street Los Angeles, California 90006
10	Leonard E. Larson Assistant Superintendent for Instruction Maryville Joint Unified School District Olivehurst, California 95961
11	Dr. Joseph M. Pettit Dean, School of Engineering Stanford University Palo Alto, California 94305 Questionnaire completed by Kenneth S. Down, Administrative Manager, Stanford Instructional Television Network.
12	Allan W. Fink Coordinator of Learning Materials Pasadena Unified School District 351 South Hudson Street Pasadena, California 91100
13	Thomas L. Banks Coordinator, Educational Television University of California - San Francisco San Francisco Medical Center Third and Parnassus Avenue San Francisco, California 94122

System Number	Name, Title, Address
14	Reverend Pierre DuMaine Assistant Superintendent of Schools Archdiocese of San Francisco 443 Church Street San Francisco, California 95114 Questionnaire completed by George Sitts, Director of Technical Services
15	William Phillips Director of Learning Resources Palm Beach County School Board 301 North Olive Avenue West Palm Beach, Florida 33402
16	Mrs. Marion V. Lowry Coordinator of Television Instructional Television Center Board of Public Instruction of Broward County 6600 South Nova Drive Fort Lauderdale, Florida 33314 Questionnaire completed by Dale R. Carls, Operations Manager
17	Mrs. Angeline S. Welty Director of Educational Media Services Dade County Public Schools Administrative Offices Lindsey- Hopkins Building 1410 East 2nd Avenue Miami, Florida 33132
18	Very Reverend Monsignor Joseph H. O'Shea Archdiocesan Director of Instructional Television Archdiocese of Miami 6200 N.E. Fourth Court Miami, Florida 33138
19	David L. Glazer Director of Communications Emory University Medical School and Grady Memorial Hospital 80 Butler Street S.E. Atlanta, Georgia 30303

System Number	Name, Title, Address
20	Dr. Robert W. Pirsein Township Instructional Television Coordinator New Trier Township Instructional Television System New Trier Township High School Winnetka, Illinois 60093
21	Professor Phillip Weinberg Director, Educational Television Center Jobst Hall Bradley University Peoria, Illinois 61606 Questionnaire completed by Joel L. Hartman, Operations Manager
22	Mrs. Barbara C. Griesser Director of Television Sterling Township High School Sterling, Illinois 61081
23	Elmer Friman Producer/Director, Medical Television Facility Medical Educational Resources Program Room 420 Medical Science Building 1100 West Michigan Street Indianapolis, Indiana 46202
24	William H. Kroll Operations Manager Indiana University at Bloomington Bloomington, Indiana 47401
25	Robert G. Baize Chief Engineer/ Instructor Owensboro Public School System Owensboro Vocational School 1501 Frederica Street Owensboro, Kentucky 42301
26	Mrs. Wilma D. McEwen Director, Audiovisual and Educational Television Paducah Independent School District Paducah, Kentucky 42001

System Number	Name, Title, Address
27	Calvin M. Thomas II Director of Educational Services Maine Educational Television Network University of Maine Orono, Maine 04473
28	Monsignor Walter L. Flaherty Radio-Television Director Archdiocese of Boston Boston Catholic Television Center 25 Granby Street Boston, Massachusetts 02215 Questionnaire completed, by phone, by Miss Mary E. Madigan, Executive Secretary
29	Professor Roy J. Johnston Director, Division of Instructional Communications Northeastern University Boston, Massachusetts 02115
30	Robert Leffler Director of Television Alpena Public Schools Alpena, Michigan 49702
31	Anthony Reda Director of Television Archdiocese of Detroit 3800 Puritan Detroit, Michigan 48238
32	Dr. Dorothy F. Patterson Program Director Department of Educational Broadcasting Detroit Public Schools 9345 Lawton Avenue Detroit, Michigan 48206 Questionnaire completed by Ethel Tincher, Director, Department of Educational Broadcasting
33	Dr. James B. Tintera Director, Center for Instructional Technology Wayne State University 70 West Palmer Detroit, Michigan 48202

System Number	Name, Title, Address
34	William Shragg Audiovisual Director Independent School District #279 Osseo, Minnesota 55369
35	Don R. Mitchell Director of Instructional Television University of Missouri - Columbia Columbia, Missouri 65201
36	Donald D. Hawley Director, Educational Television Services Clark County School District Las Vegas, Nevada 89109
37	Reverend Michael J. Dempsey Assistant Superintendent Catholic Schools of the Diocese of Brooklyn 345 Adams Street Brooklyn, New York 11201
38	Norman Hosler Director of Instructional Television Central High School District No. 2 H. Frank Carey High School 230 Poppy Avenue Franklin Square, New York 11010
39	Owen R. Bliven Consultant, Instructional Resources Center Union Free School Distrct No. 1 Town of Tonawanda, New York Kenmore, New York 14217
40	Dorothy Elizabeth Smith Communications Coordinator Mineola Public Schools Union Free School Distrct No. 10 200 Emory Road Mineola, New York 11501 Questionnaire completed by Dr. Ben Wallace, Superintendent of Schools
41	Reverend Monsignor John J. Healy Director, Archdiocese of New York Instructional Television Archdiocese Communications Center Seminary Avenue Yonkers, New York 10704

System Number	Name, Title, Address
42	James A. Close Educational Television Curriculum Director Newburgh City School District Newburgh, New York 12550
43	Dalton Levy Director of Educational Communications and Research Plainedge Public Schools Plainedge Union Free School District No. 18 Wyngate Drive North Massapequa, New York 11761
44	Dr. Louis Brown Director of Educational Communications Central School District No. 4 Plainview, New York 11803
45	Francis J. Ryan, Jr. Administrative Director, Educational Television Diocese of Rockville Center, New York 53 North Park Avenue Uniondale, New York 11570
46	Thomas L. Russell Television Coordinator Rochester Institute of Technology Administration Building A Rochester, New York 14608
47	Warren Wightman Department of Instructional Materials Rochester Board of Education Rochester City School District 1801 East Main Street Rochester, New York 14609
48	Sam A. Agnello Director, Division of Audiovisual Education Duke University Medical Center Box 3163 Durham, North Carolina 20706
49	Dr. Gunter Grupp Director, Department of Biomedical Communications University of Cincinnati Cincinnati, Ohio 45221 Questionnaire completed by C.J. Magrish, Chief Engineer

System Number	Name, Title, Address
50	Dr. Alan R. Stephenson Director of Educational Services, WVIZ 4300 Brook Park Road Cleveland, Ohio 44134
51	James D. Bailey Director of Instructional Television Parma City Schools 6726 Ridge Road Parma, Ohio 44129
52	C. McCullough Media Director Umatilla County Intermediate Educational District Pendleton, Oregon 97801
53	Dr. Ardell L. Feeley Assistant Superintendent Altonna Area School District Altoona, Pennsylvania 16602
54	R. C. McCool Assistant Superintendent Hanover Borough School District 190 East Walnut Street Hanover, Pennsylvania 17331
55	William J. Lesko Director of Instructional Television Mifflin County School District Lewiston, Pennsylvania 17044
56	William H. Seibel Director, Office of Instructional Television Temple University 1949 North Broad Street, Room 214 Philadelphia, Pennsylvania 19122 Questionnaire completed by Alvin J. Weiss, Administrative Assistant
57	Glenn L. Schuckers Educational Television Producer/Director Centennial Schools Newton Road and Street Road Warminster, Pennsylvania 18974 Questionnaire completed by Everett A. McDonald, Jr., Superintendent of Schools

System Number	Name, Title, Address
58	C. David Cate Director Northwest Tennessee Public School Instructional Television Weakley County Board of Public Instruction Martin, Tennessee 38237
59	Dr. Cecelia Blackstock Director of Television Brazosport Independent School District Drawer Z Freeport, Texas 77541
60	Henry L. Thomas Director of Televised Instruction Spring Branch Independent School System 9000 Westview Drive Houston, Texas 77055
61	James Frehner Director, ITFS Television Mesquite Independent School District 405 East Davis Mesquite, Texas 75149
62	H. H. Bobele Director of Instructional Television Edgewood Independent School District 6458 West Commerce Street San Antonio, Texas 78237
63	Raymond T. Bedwell, Jr. Acting Director, Instructional Media Services Marquette University 625 North 15th Street Milwaukee, Wisconsin 53233
64	A. S. Close, M.D. Acting Network Director Milwaukee Regional Medical Instructional Television Stations, Inc. 2200 West Kilbourne Avenue Milwaukee, Wisconsin 53233
65	Monsignor Ralph R. Schmit Director of Instructional Television Archdiocese of Milwaukee 3800 North 92nd Street Milwaukee, Wisconsin 53200

Chapter VIII

Identified ITFS Systems for which Construction Permits Have Been Granted

Following is a list of the persons responsible for the ITFS systems for which FCC Construction Permits have been granted but which are not yet on the air. Unless otherwise indicated the person listed below was also responsible for completing the survey questionnaire:

System number	Name, Title, Address
66	James Anderson Director of Television Services University of Alabama at Birmingham Birmingham, Alabama 35233
67	Dean Robert M. Saunders Dean of School of Engineering University of California at Irvine Irvine, California 92664 Questionnaire completed by Paul D. Arthur, Associate Dean of School of Engineering
68	Sherman Gillespie c/o Dean Hadley University of Southern California University College and Summer Sessions University Park Los Angeles, California 90007
69	Paul Barstow Administrator, Television and Film Services Torrance Unified Schools Educational Materials Building 2336 Plaza del Amo Torrance, California 90500
70	Reverend Leonard Hurley Director, Radio and Television Communications Archdiocese of Washington, D.C. 6000 Georgia Avenue N.W. Washington, D.C. 20011 Questionnaire complted by Reverend Thomas W. Lyons, Director of Education, Archdiocese of Washington

System Number — Name, Title, Address

71 For St. Petersburg and Tampa: *
Frank M. Mouch
Superintendent of Education
Diocese of St. Petersburg
6333 9th Avenue North
St. Petersburg, Florida 33733

For Orlando: *
Reverend Richard Steinkemp
Chancery Office
Diocese of Orlando
Box 3069
Orlando, Florida 32802

72 Professor Bernard Crocker
Director, University of Southwestern Louisiana ITFS
University of Southwestern Louisiana
Box 2091
Lafayette, Louisiana 70501

73 Dr. Craig Fullerton
Assistant Superintendent in Charch of Instruction
School District of the City of Omaha
3902 Davenport
Omaha, Nebraska
Questionnaire completed by Mrs. Mable Goodwin,
Director of ARMS Project, Burke High School,
12200 Burke Blvd., Omaha, Nebraska 68154

74 Claude H. McAllister
Director of Television Instruction
New Hanover County Schools
Wilmington, North Carolina 28401

75 Earl Hogan
Superintendent of Schools
Mount Vernon City School
401 West Chestnut Street
Mount Vernon, Ohio 43050

76 Fred Harper
Director, Radio-Television Office
University of Pennsylvania
Philadelphia, Pennsylvania 19104

* Construction Permit held by Joseph P. Hurley, Bishop of St. Augustine. Diocese was divided in June 1968.

System Number	Name, Title, Address
77	George E. Krutilek Technical Director The Association for Graduate Education and Research of North Texas (TAGER) Post Office Box 30365 Dallas, Texas 75230
78	Grant Taylor, M.D. Dean, Division of Continuing Education The University of Texas Graduate School of Biomedical Sciences at Houston Division of Continuing Education University of Texas Houston, Texas 77025
79	Robert R. Suchy Director, Department of Instructional Resources Milwaukee Public Schools 5225 West Vliet Street Milwaukee, Wisconsin 53208 Questionnaire completed by Guy Morrison, Chief Engineer

Chapter IX

Statistical Profiles of ITFS Systems

The following statistical profiles are based on information provided by the survey respondents; these data have been presented in cumulated form in Chapter VI. These profiles define the staffing, programming, equipment, size, budget and useage of each of the 65 ITFS systems now on the air. The right-hand column indicates the stations and channels for which licenses and/or construction permits have been granted.

A sample survey questionnaire is included in Appendix I of this study. Following is a key to the abbreviations contained in the statistical profiles:

Staff

FT = Full-time
PT = Part-time

Positions:

Curriculum specialist
Television teacher
Producer-Director
Engineer
Television technician
Graphics specialist
Clerical
Student assistant

Equipment

Transmitters (Manufacturer)
Down converters (Manufacturer)
Cameras (Image orthicon, vidicon, plumbicon)
Videotape recorder
Kinescope recorder
Film or slide chain
Projectors (16mm, opaque, slide)
Mobile units
Other

Description

Number of studios
Number of buildings
Number of classrooms
Number of students
Hours/week on the air
Radius

Programming

Percentage of local programming
Types of programming:

A = Supplementary -- Lessons presented once or twice
B = Direct -- major part of a course presented by the television teacher with some supplementary classroom work
C = Enrichment -- programs designed to capture outstanding local resources which are not available to the classroom
D = Total teaching -- entire course taught over TV with no assistance from the classroom teacher
E = In-service education
F = Monitoring (e.g. study halls)
G = Testing
H = Film distribution
I = Orientation
J = Administrative announcements
K = Off campus college courses for which students receive college credit, pay tuition to the institution
L = Industrial location courses for which students receive credit, employer pays tuition
M = Religious training outside regular classes
N = Panels, interviews, etc. in which students participate

Budget

Total capital investment
Total operating budget

Sources:

FG = Federal government
SG = State government
LG = Local government
Community (non-government)
Diocese or parish
College or university

Other

PI = Programmed instruction
VTR= Videotape for redistribution over CCTV or other internal distribution system

Innovative applications -- as listed by respondents
Survey -- firm which conducted original engineering study for the system

Channels

Station call letters
Column 1: Channel designation
Column 2: Date of construction permit
Column 3: Date on the air
Column 4: Date on which license was applied for (pending) or received (granted).

1. Birmingham School System
Birmingham, Alabama

Staff:	8 FT, 11 PT
Curr. Sp.	4 FT
Prod.-Dir.	2 PT
Engineer	2 PT
TV tech.	2 FT, 4 PT
Clerical	2 FT
Students	2 PT
Equipment	
Trans.	8
Down conv.	96
Cameras	2 IO, 2 vid.
VTR	5
F/S chain	4
Projectors	2 16mm, 4 sl.
Description:	
Studios	2
Bldgs.	96
Classrms	95% eq.
Hrs/week	105

Programming: 10% local
A,B,C,E,H,I,J,N
Budget: 300K cap, 82K op.
Capital: 200K FG, 100K SG
Operating: 82K FG
Survey: Alabama ETV Network

Originating

KZW-56				
G-1	5-8-69	12-69	12-5-69	(Pending)
G-2	2-14-68	12-68	12-5-69	(Pending)
G-3	2-14-68	12-68	12-5-69	(Pending)
G-4	5-8-69	3-70	12-5-69	(Pending)

Relay

KLC-77				
E-1	4-15-69	12-69	12-5-69	(Pending)
E-2	8-20-68	4-69	3-28-69	(Pending)
E-3	8-20-69	4-69	3-28-69	(Pending)
E-4	4-15-69	3-70	12-5-69	(Pending)

Special case: Off the air 11-7-69

KZW-55		
E-2	2-14-68	12-9-68
E-3	2-14-68	12-9-68

2. Jefferson County Board of Education
Birmingham, Alabama

Staff: 8 FT

Curr. Sp.	1 FT
Prod-Dir.	2 FT
Engineer	2 FT
Technician	1 FT
Clerical	2 FT
Students	3 FT

Equipment:

Trans.	8 EMCEE
Down conv.	84 Bogner
Cameras	2 IO (color)
VTR	3
F/S chain	4
Projectors	5 16mm,2 op.,4 sl.

Description:

Studios	1
Buildings	89
Classrms	956
Students	36,000
Hrs/wk.	50
Radius	20'

Programming: Under 10% local
A,E,H,J,N

Budget:	500K FG, 125K LG
Capital	400 K FG, 100 K LG
Operating	125 K FG

Survey: Signal Engineering and Sales

Originating

KIP-47				
A-2	6-12-68	9-69	5-23-69	(Pending)
A-3	6-12-68	9-69	5-23-69	(Pending)

Relay:

KIP-49				
C-2	6-12-68	9-69	5-23-69	(Pending)
C-3	6-12-68	9-69	5-23-69	(Pending)

C.P.'s granted - not yet on the air:

KIP-47	
A-1	8-18-69
A-4	8-18-69
KIP-49	
C-1	8-18-69
C-4	8-18-69

3. Etowah County Board of Education
Gadsden, Alabama

Staff: 12 FT, 4 PT

Curr. Sp.	2 FT
TV teacher	5 FT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 PT
Clerical	1 FT, 1 PT
Students	2 PT

Equipment:

Trans.	2 Chester
Down conv.	6 Chester
Cameras	2 vidicon
VTR	1
Projectors	1 slide

Description:

Studios	1
Buildings	5
Classrms	10
Students	4000
Hrs/week	15
Radius	10'

Programming: 75+% local
A,C,E,N
Budget: 120K cap. 105K op.
Capital 100K FG, 200K SG
Operating 90K FG, 15K, LG
Innovation: Two-way communication
Survey: Sylvania - Chester Electronics

Originating:

KCI-53

A-1	9-8-68	3-70	3-2-70 (Pending)
A-2	9-8-69	3-70	3-2-70 (Pending)

Relay:

KCO-38

E-1	9-8-69	3-70	3-2-70 (Pending)
E-2	9-8-69	3-70	3-2-70 (Pending)

C.P.'s granted - not yet on the air

KWV-56

A-1	3-19-70
A-2	3-19-70

4. City Board of Education
Huntsville, Alabama

Staff: 10 FT, 19 PT

Curr. Spr.	2 FT
TV teacher	2 FT, 2 PT
Prod-Dir.	3 FT
Engineer	1 FT
Technician	1 FT
Graphics	1 PT
Clerical	1 FT, 2 PT
Students	14 PT

Equipment:

Trans.	4 EMCEE
Down conv.	32 EMCEE
Cameras	5 IO, 3 vid.
VTR	4
F/S chain	2
Projectors	2 16mm,2 slide
Mobile van	1

Description:

Studios	1
Buildings	29*
Classrms	950
Students	30,000
Hrs/week	75
Radius	10'

Programming: 10%-25% local
A,B,C,E,H,I,J,N.
Budget: 310K cap. 25K op.

Capital	200K FG, 100K SG, 10K LG
Operating	60K SG, 70K LG, 12K grants

VTR for redistribution
Survey. Signal Engineering and Sales, Alabama ETV Commission

* ITFS is extended to five Huntsville schools by CATV. All Decatur Schools (20' west) use Huntsville ITFS through Decatur CATV. University of Alabama receives signal; Huntsville Model City Community Center plans to use the ITFS system eventually

Originating

KHU-75

D-1	6-23-66	9-66	6-23-66	(Granted)
D-2	6-23-66	9-66	6-23-66	(Granted)
D-3	6-23-66	9-66	6-23-66	(Granted)
D-4	6-23-66	9-66	6-23-66	(Granted)

5. Anaheim City School District
Anaheim, California

Staff: 23 FT	
TV teacher	9 FT
Prod-Dir.	3 FT
Engineer	2 FT
Technician	2 FT
Graphics	1 FT
Clerical	3 FT
Support	3 FT
Equipment:	
Trans.	3 Micro-link
Down conv.	25 Micro-link
Cameras	9 vidicon
VTR	4
F/S chain	2
Projectors	4 16mm, 2 sl.
Description:	
Studios	2
Bldgs	23
Classrooms	230
Students	8000
Hrs/week	20
Radius	10'
Programming:	75+% local
B,C,E,H,I,J	
Budget:	900K cap. 829K op.
Capital	75K FG, 825K LG
Operating	5K SG, 824K LG
Survey:	Self

Originating:

KUZ-56		
A-1	9-9-66	3-68
A-2	9-9-66	3-68
A-3	9-9-66	4-70

CP granted - not yet on the air

KUZ-56	
A-4	9-9-66

6. Fresno County Schools
Fresno, California

Staff: 7 FT, 54 PT	
Curr.Spec.	12 PT (staff)
TV teacher	40 PT (equiv. 2 FT teachers)
Prod-Dir.	1 FT
Engineer	1 FT
Technician	3 FT
Graphics	1 PT
Clerical	2 FT, 1 PT
Equipment:	
Trans.	4 Micro-link
Down conv.	180 Micro-link
Cameras	4 plumbicon
VTR	2
E/S chain:	2
Projectors	2 16mm, 2 sl.
Description:	
Studios	1
Bldgs.	143
Classrms	900
Students	61,000
Hrs/week	36
Radius	50'
Programming:	25%-50% local
A,B,C,E,G,H,I,J,K,N	
Budget: 728K cap, 385,500 op.	
Capital	728 K FG
Operating	200K FG, 55K SG, 130K LG 500 diocese

Survey: Micro-link Varian Associates

Originating:

KVK-21				
G-3	11-16-66	5-67	5-24-67	(Pending)
G-4	11-16-66	5-67	5-24-67	(Pending)

Relay

KYD-25				
B-1	4-26-67	5-67	5-24-67	(Pending)
B-2	4-24-67	5-67	5-24-67	(Pending)
KZM-20				
C-1	12-6-67	6-69	5-26-69	(Pending)
C-2	12-6-67	6-69	5-26-69	(Pending)
KZM-21				
C-1	11-30-67	6-69	5-26-69	(Pending)
C-2	11-26-67	6-69	5-26-69	(Pending)
KZM-22				
C-1	11-30-67	6-69	5-26-69	(Pending)
C-2	11-30-67	6-69	5-26-69	(Pending)

7. North Orange County Junior College District
Fullerton, California
N.B.: Relay for Anaheim City School District
See Anaheim, #5, for description

Staff: N.A.

Equipment:	
Trans.	3 Micro-link
Down conv.	1 Micro-link
Description:	
Buildings	23
Students	12,000
Hrs/week	20
Radius	10'
Programming:	No local
B,C,E,G,H,J	
Budget: 80K cap. 5K op.	
Capital	80K LG
Operating	5K LG

PI
Survey: RCA

Relay:

KVP-26			
F-1	1-5-67	3-68	12-12-68 (Pending)
F-2	1-5-67	3-68	12-12-68 (Pending)
F-3	1-5-67	4-70	

C.P. granted - not yet on the air

KVP-26	
F-4	1-5-67

8. Board of Education, Long Beach Unified School District
Long Beach, California

Staff: 7 FT, 1 PT (serve radio and TV facilities)

Prod-Dir	2 FT
Engineer	2 FT
Clerical	1 FT, 1 PT
Equipment:	
Trans.	2 Chester
Down conv.	18
Cameras	2 vidicon
VTR	5
F/S chain	1
Projectors	1 16mm, 1 op, 1 sl.
Description:	
Studios	2
Buildings	17
Classrms	400
Students	16,000
Hrs/week	15
Radius	5'
Programming:	Under 10% local

A,B,C,E,H,I,J,N
Budget: Not available
Survey: Robert E. Bullock
Consulting Engineer

Originating

KZH-31

D-1	11-7-67	10-69	10-6-69 (Pending)
D-2	11-7-67	10-69	10-6-69 (Pending)

CP's granted but not yet on the air

KZH-31

D-3	11-7-67
D-4	11-7-67

9. Archdiocese of Los Angeles Education and Welfare Corporation
Los Angeles, California

Staff: 5 FT, 13 PT	
Curr.sp.	1 PT
TV teacher	5 PT
Prod-Dir.	1 FT
Engineer	2 FT
Technician	1 FT
Graphics	1 PT
Clerical	1 FT, 1 PT
Students	5 PT
Equipment	
Trans.	8 Chester
Down conv.	85 Chester
Cameras	2 IO
VTR	3
F/S chain	1
Description	
Studios	1
Buildings	75 (several bldgs. at each site)
Classrooms	870
Students	37,000
Hrs/week	75
Radius	45'
Programming:	Under 10% local
A,C,E,J,K,M	
Budget: 600K cap., 225K op.	
Capital	600K diocese
Operating	225K diocese

Innovation: Talk-back, computer data retrieval, facsimile transmission - exploratory
Survey: Litton Industries

Originating:

KSW-92				
D-1	6-26-69	2-67	3-31-67	(Pending)
D-2	6-26-69	9-67	3-31-67	(Pending)
D-3	6-26-69	8-68	3-31-67	(Pending)
D-4	6-26-69	8-69	3-31-69	(Pending)

Relay:

KSW-93				
G-1	5-7-65	2-67	3-31-67	(Pending)
G-2	5-7-65	9-67	3-31-67	(Pending)
G-3	5-7-65	8-68	3-31-67	(Pending)
G-4	5-7-65	8-69	3-31-67	(Pending)

10. Maryville Joint Unified School District
Olivehurst, California

Staff: 2 FT, 13 PT	
TV Teacher	10 PT
Prod-Dir.	1 FT
Engineer	1 FT
Students	3 PT
Equipment	
Trans	2 Conrac
Down conv.	2 Conrac
Cameras	3 vid., 1 plumb.
VTR	5
Mobile van	1
Description:	
Buildings	2
Classrms	12
Students	1000
Hrs/week	30
Radius	25'
Programming:	75+% local
A,C,E,	
Budget: 34K op.	
Operating	15K FG, 950 SG, 10K LG

VTR for redistribution
Innovation: DAIRS
Survey: Ward-Davis

Originating:

WAE-22				
B-1	3-19-69	1-70	11-14-69	(Granted)
B-2	3-19-69	1-70	11-14-69	(Granted)

11. Board of Trustees of the Leland Stanford Junior University
Palo Alto, California

Staff:	Stanford - 7 FT, 20 PT Ass'n for Cont. Educ.-2 FT
Admin. Mgr.	1 FT (SU)
Admin.Asst.	1 FT (SU)
Engineer	3 FT (SU)
Clerical	1 FT (SU)
Courier	1 FT (SU)
Students	20 PT (SU)
Gen'l Mgr.	1 FT (ACE)
Clerical	1 FT (ACE)
Equipment	
Trans.	4 Micro-Link
Down conv.	20 Micro-link,Chester
Cameras	11 vidicon
VTR	15+
Projectors	1 16mm, 5 slide
Talk-back	
Description:	
Studios	5
Buildings	23+
Classrooms	65−
Students	900 (250 SU,650ACE)
Hrs/week	136
Radius	40'
Programming	75+% local
D,L,N	
Budget:	700K cap., 100K op.
Capital	700K industry, members of Stanford Network
Operating	100K industry, members of Stanford Network

Survey: Genesys Systems, Inc., Mountain View, California

Originating:

KCG-38			
E-1	4-9-68	10-69	2-13-70
E-2	4-9-68	10-69	2-13-70
E-3	4-9-68	4-69	2-13-70
E-4	4-9-68	4-69	2-13-70

12. Pasadena Unified School District
Pasadena, California

Staff: 5 FT, 20 PT

Curr. Sp.	10 PT
TV teacher	1 PT
Prod-Dir.	1 FT, 2 PT
Engineer	3 FT
Technician	4 PT
Graphics	1 PT
Clerical	1 FT
Students	2 PT

Equipment:

Trans	4 Jerrold
Down conv.	EMCEE, Jerrold, Micro-link
Cameras	2 vid., 4 plumb.
VTR	5
F/S chain	2
Projectors	2 16mm, 1 sl.
Mobile unit	

Description:

Studios	1
Bldgs	34
Classrooms	350
Students	20,000
Hrs.week	100
Radius	6'

Programming: Under 10% 10cal
A,B,C,E,G,H,I,J,N
(RETAC programming)

Budget: 420K cap, 50K oper.

Capital	120K FG, 300K LG
Operating	50K LG

VTR for redistribution

Survey: Robert E. Bullock
Consulting Engineer

Originating:

KQI-29				
E-1	8-26-66	6-67	4-16-69	(Granted)
E-2	8-26-66	6-67	4-16-69	(Granted)
E-3	8-26-66	6-67	4-16-69	(Granted)
E-4	8-26-66	6-67	4-16-69	

13. Regents of the University of California
San Francisco, California

Staff: 11 FT	1 PT
Prod-Dir.	2 FT
Engineer	1 FT
Technician	6 FT
Clerical	1 FT, 1 PT
Coordinator	1 FT
Equipment	
Trans	2 EMCEE, Micro-link
Down conv.	5 EMCEE, Micro-link
Cameras	6 IO, 10 vidicon
VTR	2
F/S chain	1
Description	
Studios	1
Buildings	5
Classrooms	25
Students	2500
Hrs/week	10-20
Radius	8'
Programming	75+% local
A,C,E	

Budget: 650K cap., 160K op.

Capital	600K college, 50K grants
Operating	135K college, 25K professional organizations and grants

VTR for redistribution
Survey: University engineer

Originating:

KTB-97			
F-4 7-14-65	10-66	6-17-68	(granted)
KHU-89			
F-2 6-26-66	1-67	5-4-67	(Grantes)

300

14. Roman Catholic Welfare Corporation
San Francisco, California

Staff: 9 FT, 5 PT

Curr.sp.	1 FT
TV teacher	2 FT
Prod-dir.	1 FT
Engineer	1 FT
Technician	3 FT
Graphics	1 PT
Clerical	1 FT
Students	4 PT

Equipment

Trans.	16 Jerrold
Down conv.	65 Micro-link
Cameras	6 vid., 2 plumb.
VTR	11
F/S chain	2
Projectors	3 16mm,1 op.,3 sl.

Description

Studios	1
Buildings	51
Classrooms	460
Students	16,000
Hrs/week	30
Radius	14.5'

Programming: Under 10% local
A,B,C,E,G,H,J,M,N

Budget: 680K cap., 240K op.

Capital	680 K diocese
Operating	240K diocese

VTR for redistribution
Survey: Hammett and Edison

Originating:
KZB-22

G-1	9-13-67	1-70
G-2	9-13-67	1-70
G-3	9-13-67	1-70
G-4	9-13-67	1-70

Relay:
KZB-24

D-1	9-21-67	2-70
D-2	9-21-67	2-70
D-3	9-21-67	2-70
D-4	9-21-67	2-70

KZB-25

D-1	9-21-67	2-70
D-2	9-21-67	2-70
D-3	9-21-67	2-70
D-4	9-21-67	2-70

CP's granted - not yet on the air
KZB-23

B-1	9-21-67
B-2	9-21-67
B-3	9-21-67
B-4	9-21-67

15. Board of Public Instruction of Palm Beach County
Boynton Beach, Florida

Staff:	44 FT, 10 PT
Curr. Sp.	1 FT
TV teacher	10 FT, 10 PT
Prod-Dir.	6 FT
Engineer	9 FT
Technician	8 FT
Graphics	5 FT
Clerical	5 FT
Equipment	
Trans	10 Jerrold
Down conv.	72 Micro-link Jerrold
Cameras	7 IO, 4 vid.
VTR	4
F/S chain	4
Projectors	8 16mm, 4 sl.
Mobile unit	
Description	
Studios	4
Bldgs	72
Classrms	800
Hrs/week	33
Radius	2500 sq.mi.
Programming:	75+% local

A,B,C,E,H,J,K,N

Budget: 1,300,000 cap., 596K op.

Capital	1,300,000 FG
Operating	215K FG, 381K LG

VTR for redistribution

Innovation: Selected materials available for instant transmission upon phone request by teaching personnel

Survey: Adair and Brady, Lake Worth, Texas

Originating

KHU-90				
E-1	7-26-66	1-68	4-22-69	(Granted)
E-2	7-26-66	1-68	4-22-69	(Granted)
E-3	7-26-66	1-68	4-22-69	(Granted)
E-4	7-26-66	1-68	4-22-69	(Granted)

Relay:

KZB-28				
A-1	9-25-67	9-68	4-22-69	(Granted)
A-2	9-25-67	9-68	4-22-69	(Granted)
KZB-30				
H-1	9-25-67	10-68	1-10-69	(Pending)
H-2	9-25-67	10-68	1-10-69	(Pending)
KZB-29				
G-1	9-25-67	9-68	4-22-69	(Granted)
G-2	9-25-67	9-68	4-22-69	(Granted)

16. Board of Public Instruction of Broward County
Fort Lauderdale, Florida

Staff: 60 FT, 5 PT

Curr. Sp.	6 FT
TV teacher	6 FT
Prod-Dir.	4 FT
Engineer	2 FT
Technician	8 FT
Graphics	5 FT, 3 PT
Clerical	8 FT
Students	3 PT

Equipment:

Trans.	8 Micro-link, Jerrold
Down conv.	100 Micro-link, Jerrold
Cameras	3 IO, 5 vid.
VTR	6
F/S chain	3
Projectors	3 16mm, 2 sl.

Description:

Studios	1
Bldgs.	100
Classrms	1456
Students	60,000
Hrs/week	60
Radius	12'

Programming: 75+% local
A,C,E,I,J

Budget: 1,792,000 cap, 1,256,000 op.
Capital 1,102,000 FG, 690K LG
Operating 365K FG, 891K LG

VTR for redistribution

Survey: Adair-Brady, Lake Worth, Texas

Originating:

KTZ-22				
G-1	11-22-65	1-67	1-30-68	(Granted)
G-2	11-22-65	1-67	1-30-68	(Granted)
G-3	11-22-65	1-67	1-30-68	(Granted)
G-4	11-22-65	1-67	1-30-68	(Granted)

Relay:

KLC-80				
B-1	8-22-68	9-69	10-6-69	(Granted)
B-2	8-22-68	9-69	10-6-69	(Granted)
B-3	8-22-68	9-69	10-6-69	(Granted)
B-4	8-22-68	9-69	10-6-69	(Granted)

17. Board of Public Instruction of Dade County
Miami, Florida

Staff: 12 FT, 7 PT	
Curr.Sp.	Consultants
TV teacher	2 FT, 1 PT
Prod-Dir.	1 FT, 1 PT
Engineer	2 FT
Technician	2 FT, 1 PT
Graphics	1 FT, 1 PT
Clerical	2 FT, 1 PT
Students	2 PT
Equipment:	
Trans.	2 Micro-link
Down conv.	40 Micro-link
Cameras	1.3 IO, .3 vid.
VTR	1.6
F/S chain	1.3
Projectors	1.3 16mm, 1 sl.
Description	
Studios	2 (shared)
Buildings	37
Classrms	42 (inc. auds.)
Students	33,995
Hrs/week	33
Radius	20'
Programming:	75+% local
A,B,C,E,H,I,J,N	
Budget: 95K cap., 35K op.	
Capital	95K LG
Operating	35K LG
Production	107,800

VTR for redistribution
Innovation: Systems approach to production, utilization and validation of series
Survey: Adler Educational Systems Division

Originating:
KTB-84

F-1	6-18-65	1-68	10-11-67 (Pending)

Relay:
KTB-85

C-1	6-18-65	1-68	10-11-67 (Pending)

CP's granted - not yet on the air
KTB-84

F-2	6-18-65
F-3	6-18-65
F-4	6-18-65

KTB-85

C-2	6-18-65
C-3	6-18-65
C-4	6-18-65

18. Archdiocese of Miami
Miami, Florida

Staff: 5 FT	
TV supv.	1 FT
Engineer	2 FT
Clerical	2 FT
Equipment	
Trans	4 Micro-link
Down conv.	70 Micro-link
Cameras	1 vidicon
VTR	2
F/S chain	1
Projectors	1 16mm, 1 sl.
Description	
Studios	
Buildings	70
Classrooms	500
Students	32,000
Hrs/week	60
Radius	55'
Programming:	Under 10% local
A,B,C,E,F,H,I,M,N	
Budget: 500K cap., 90K op.	
Capital	500K diocese
Operating	90K diocese

VTR for redistribution
Innovation: Advanced placement programs
Survey: RCA

Originating:			
KRL-41			
A-2	12-16-64	11-65	10-27-65 (Pending)
A-3	12-16-64	9-66	10-27-65 (Pending)
Relay:			
KRL-42			
C-2	12-16-64	9-67	8-26-66 (Pending)
C-3	12-16-64	9-67	8-26-66 (Pending)
CP's granted - not yet on the air			
KRL-41			
A-1	12-16-64		
A-4	12-16-64		
KRL-42			
D-1	12-16-64		
D-4	12-16-64		
KRL-43			
A-1	12-16-64		
A-2	12-16-64		
A-3	12-16-64		
A-4	12-16-64		
KRL-44			
C-1	12-16-64		
C-2	12-16-64		
C-3	12-16-64		
C-4	12-16-64		

19. The Fulton-DeKalb Hospital Authority
Atlanta, Georgia

Staff: 11 FT, 1 PT	
Prod-Dir.	1 FT, 1 PT
Engineer	3 FT
Technician	1 FT
Clerical	2 FT
Equipment	
Trans.	2 RCA
Down conv.	29 Micro-link
Cameras	9 IO, 2 vid.
VTR	53
F/S chain	1
Projectors	2 16mm, 1 op., 4 sl.
Description	
Studios	3
Buildings	29
Classrooms	150
Students	1000+
Hrs/week	20-22
Radius	32'
Programming:	75+% local
A,B,C,E,F,I,N	
Budget: 300K cap., 160K op.	
Capital	300K FG, SG
Operating	160K SG

Originating:

KVI-65				
A-1	11-9-66	1-68	7-21-67	(granted)
A-4	11-9-66	1-68	7-21-67	(granted)
KVI-66				
A-2	11-9-66	1-68	7-19-67	

VTR for redistribution. Retelecast by Georgia ETV system.
Survey: RCA

20. Board of Education of Township High School #203 of Cook County
Northfield, Illinois

Staff: 6 FT, 77 PT	
Prod-Dir.	2 FT
Engineer	1 FT
Technician	1 FT
Graphics	1 PT
Clerical	1 FT, 1 PT
Students	75 PT
Coordinator	1 FT
Equipment	
Trans.	5 Micro-link
Down conv.	31 - Jerrold, Micro-link, EMCEE
Cameras	5 vidicon (1color)
VTR	7
F/S chain	2
Projectors	3 16mm, 2 slide
Descriptions	
Studios	1
Buildings	31
Classrooms	400--500
Students	23,000
Hrs/week	90
Radius	55'
Programming:	25%-50% local
A,B,C,E,G,H,I,J,N	
Budget: 400K cap., 111K op.	
Capital	400K LG
Operating	20K SG, 90K LG,1K diocese

VTR for redistribution
PI
Survey: Video Systems, Inc.

Originating:

KZB-26				
H-1	9-13-67	9-69	10-6-69	(Granted)
KGZ-66				
A-1	3-9-65	7-66	7-7-67	(Granted)
A-2	3-9-65	7-66	7-7-67	(Granted)
A-3	3-9-65	7-66	7-7-67	(Granted)
A-4	3-9-65	7-66	7-7-67	(Granted)

21. Bradley University*
Peoria, Illinois

Staff: 6 FT, 35 PT	
Curr. Sp.	1 PT
Prod-Dir.	1 FT
Engineer	2 FT, 2 PT
Graphics	3 PT
Clerical	1 FT, 2 PT
Students	30 PT
Equipment:	
Trans	8 EMCEE
Down conv.	100 EMCEE
Cameras	4 IO, 5 vid.
VTR	4
F/S chain	2
Projectors	2 16mm, 2 sl.
Mobile van	
Description:	
Studios	2
Buildings	100
Classrms	800
Students	30,000
Hrs/week	111
Radius	35'-40'
Programming:	Under 10% local
A,C,E,I,K,L	
Budget: 650K cap., 130K op.	
Capital	375K FG, 275K College
Operating	

VTR for redistribution
Survey: Medicom, Inc.

Originating:

KTZ-30				
C-1	10-26-65	9-65	4-21-69	(Granted)
C-2	10-26-65	9-65	4-21-69	(Granted)
C-3	10-26-65	9-65	4-21-69	(Granted)
C-4	10-26-65	9-65	4-21-69	(Granted)

Relay:

KVO-30				
E-1	12-23-66	9-67	4-21-69	(Granted)
E-2	12-23-66	9-67	4-21-69	(Granted)
KVO-29				
A-1	12-23-66	9-67	1-16-67	(Pending)
A-2	12-23-66	9-67	1-16-67	(Pending)

* Permit held by Bradley University for all ITFS programming is for public and parochial school systems in the surrounding area. Bradley campus has CCTV system for internal distribution.

22. Board of Education of Sterling Township High School District #300
Sterling, Illinois

Staff: 16 PT
Prod-Dir. 3 PT
Technician 2 PT
Students 10 PT

Originating:

KVI-62
D-3 11-7-66 10-67 4-19-68

Equipment
Trans. 1 EMCEE
Down conv. 9 EMCEE
Cameras 4 vidicon
VTR 3
F/S chain 1
Projectors 1 16mm, 1 sl.
Mobile van

Description
Studios 1
Buildings 8
Classrms 120
Students 3800
Hrs/week 30
Radius 15'

Programming: 10%-25% local
A,B,C,E,G,H,I,J,N

Budget: 125,500 cap, 26,850 op.
Capital 37,500 FG, 25,000 SG, 63,000 LG
Operating 12,900 FG, 12,500 SG, 1,450 LG

Innovation: Vocational guidance via ITFS system

Survey-: Medicom, Inc.

23. Trustees of the Indiana University
Indianapolis, Indiana

Staff: 11 FT	
Curr. sp.	1 FT
Prod-Dir.	2 FT
Engineer	2 FT
Technician	2 FT
Graphics	1 FT
Clerical	2 FT
Film prod.	2 FT
Equipment	
Trans.	2 RCA
Down conv.	8 RCA
Cameras	1 IO, 6 vid.
VTR	5
F/S chain	1
Projectors	1 16mm,1 op.,1 sl.
Mobile unit	
Description	
Studios	1
Buildings	7
Hrs/week	15
Radius	12'
Programming:	25%-50% local
A,C,N	
Survey: Jansky and Bailey	

Originating:

WAT-21			
E-1	5-1-69	11-17-69	11-3-69
E-2	5-1-69	11-17-69	11-3-69

24. The Trustees of Indiana University
St. John, Indiana
N.B. Relay of Indiana Higher Education
Telecommunications System.

Equipment
Trans. 2 RCA
Down conv. 7 RCA

Description:
Buildings 7
Classrooms 15
Students 800
Hrs/week 20-30
Radius 31'
Programming: No local
A,B,C,K
Budget: 65K cap., 12K op.
Capital 65K SG
Operating 12K SG
Survey: Jansky and Bailey.

Relay:

KPD-40				
A-1	12-27-68	10-69	10-20-69	(Pending)
A-2	12-27-68	10-69	10-20-69	(Pending)

25. Owensboro Vocational School
Owensboro, Kentucky

Staff: 1 FT, 16 PT
Engineer 1 FT
Students 16 PT
Equipment:
Trans. 2 RCA
Down conv. 10 RCA
Cameras 5 vidicon
VTR 3
F/S chain 2
Projectors 2 16mm, 1 sl.
Telebeam large screen TV proj.
Mobile van
Description:
Studios 1
Buildings 10
Classrms 100
Radius 1.5'
Programming: 25%-50% local
A,C,E,H,I
Budget: 289K capital
Capital FG, SG, LG
Innovation: Facility will be used to train electronic technicians with 1st Class license to operate and maintain similar equipment
Survey: RCA

Originating:

KBK-71		
A-1	7-11-69	3-20-70
A-2	7-11-69	3-20-70

26. Board of Education of the Paducah Independent School District
Paducah, Kentucky

Staff: 4 FT, 2 PT	
Engineer	1
Technician	1
Clerical	1
Equipment	
Trans	4 Jerrold
Down conv	14 Jerrold
Cameras	5 vid. (2 color)
VTR	4
F/S chain	1
Projectors	2 16Mm, 1 slide
Description:	
Studios	1
Bldgs.	14
Classrms	161
Students	5000
Hrs/week	22
Radius	5'
Programming:	Under 10% local
C,D,E,G,H,I	
Budget	
Survey: Jerrold	

Originating:

KGA-28				
A-1	5-14-68	4-17-69	1-15-69	(Pending)
A-2	5-14-68	4-17-69	1-15-69	(Pending)
A-3	5-14-68	4-17-69	1-15-69	(Pending)
A-4	5-14-68	4-17-69	1-15-69	(Pending)

27. University of Maine
Orono, Maine

Staff: 3 PT	
Curr. sp.	1 PT
Prod-Dir.	1 PT
Engineer	1 PT
Equipment	
Trans	2 Micro-link
Down conv.	4
Cameras	3 IO, 3 vid.
VTR	3
F/S chain	2
Projectors	4 16mm, 2 sl.
Description:	
Studios	2
Buildings	3
Classrooms	22
Students	200
Hrs/week	5
Radius	10'
Programming	Under 10% local
A,C	
Budget: 20K cap., 6K op.	
Capital	20K SG
Operating	4Kcollege, 2K other
Survey: Maine ETV	

Originating:

KVI-60			
D-1	11-7-66	10-10-68	4-18-69 (Granted)
KVI-61			
D-1	11-7-66	4-9-68	6-17-68 (Granted)

28. Boston Catholic Television Center
Boston, Massachusetts

Staff: 7 FT	
Curr. sp.	1 FT
Producers	2 FT
Director	1 FT
Engineer	2 FT
Clerical	1 FT
Equipment	
Trans.	
Down conv.	150
Cameras	11 vidicon
VTR	5
F/S chain	2
Projectors	1 16mm, 1 sl.
Description	
Studios	2
Buildings	150
Students	151,000
Hrs/week	60
Programming:	25%-50% local
A,B,C,D,E,H,I,K,M,N	
Budget: 1 million cap. 150K-175K op.	
Capital	1 million, diocese, BCTC
Operating	

Originating:

KVQ-24			
D-3	1-18-67	12-11-67	12-11-67 (Pending)
D-4	1-18-67	12-11-67	12-11-67 (Pending)

Relay:

KMA-57			
F-3	9-19-68	12-17-68	12-17-68 (Pending)
F-4	9-19-68	12-17-68	12-17-68 (Pending)
KLC-85			
G-3	9-27-68	12-17-68	12-17-68 (Pending)
G-4	9-27-68	12-17-68	12-17-68 (Pending)
WAL-20			
G-3	4-14-69	6-18-69	6-18-69 (Pending)
G-4	4-14-69	6-18-69	8-18-69 (Pending)
KQT-47			
F-3	9-8-69	1-20-70	1-20-70 (Pending)
F-4	9-8-69	1-20-70	1-20-70 (Pending)
KQT-48			
F-3	9-8-69	9-24-69	9-24-69 (Pending)
F-4	9-8-69	9-24-60	9-24-69 (Pending

C.P's granted -- not on air

KVQ-24		WAL-20	
D-1	1-18-67	G-1	4-14-69
D-2	1-18-67	G-2	4-14-69
KMA-57		KQT-47	
F-1	9-19-68	F-1	9-8-69
F-2	9-19-67	F-2	9-8-69
KLC-85		KQT-48	
G-1	8-27-68	F-1	9-8-69
G-2	8-27-68	F-2	9-8-69

29. Northeastern University
Boston, Massachusetts

Staff: 12 FT, 15 PT

Curr. sp.	1 FT
TV teacher	20 FT
Prod-Dir.	2 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 FT
Clerical	2 FT
Students	15 PT

Equipment

Trans	2 Jerrold
Down conv.	6 Jerrold
Cameras	3 plumbicon
VTR	5
F/S chain	1
Projectors	1 16mm, 2 sl.
Mobile unit	

Description

Studios	1
Buildings	4
Classrooms	18
Students	500
Hrs/week	20
Radius	20'.

Programming: 75+% local
A,B,C,H

Budget: 460K cap., 186K op.

Capital	300K FG, 160K college
Operating	186K college

VTR for redistribution
PI
Innovation: DAIRS
Survey: Lake Systems, Inc., Watertown, Mass.

Originating:

KYP-23

B-2	7-7-67	4-16-68	4-14-69 (Granted)
B-4	7-7-67	4-16-68	4-14-69 (Granted)

30. Alpena Public Schools
Alpena, Michigan

Staff: 2 FT, 1 PT
Engineer 1 FT
Technician 1 PT
Clerical 1 FT
Equipment
Trans. 1 EMCEE
Down conv. 7 Prodelin
VTR 2
F/S chain 1
Projectors 1 16mm, 1 sl.
Cameras 1 16mm
Description:
Studio 1 - audio only-
Buildings 23
Classrms 170
Students 10,000
Hrs/week 38
Radius 20'
Programming: Under 10% local
A,B,C,E,I,J,K,L,N
Budget: 90,450 cap., 48,550 op.
Capital 44,450 FG, 46,000 LG
Operating 1,500 FG, 47,000 LG, 50 diocese
Survey: John F.X. Browne and Associates

Originating:

KVK-22
A-1 11-16-66 3-18-67 6-7-67 (Granted)

31. Archdiocese of Detroit
Detroit, Michigan

Staff: 7 FT, 25-30 PT

Prod-Dir	1 FT
Engineer	2 FT
Technician	2 FT, 4 PT
Graphies	1 PT
Clerical	1 FT, 2 PT
Students	25 PT

Equipment

Trans.	2 Litton,Jerrold
Down conv.	190 Litton,Jerrold
Cameras	6 IO, 2 vidicon
VTR	3
F/S chain	2
Projectors	2 16mm, 2 slide

Description

Studios	2
Buildings	190
Classrooms	1000
Students	165,000
Hrs/week	20
Radius	15'

Programming: Under 10% local
A,B,C,E

Budget: 250K cap., 150K op.

Capital	250K diocese
Operating	150K diocese

VTR for redistribution
Survey: Litton

Originating:

KRX-65				
A-1	4-1-64	12-65	8-31-67	(Granted)
A-2	4-1-64	12-65	8-31-67	(Granted)

32. Detroit Public Schools
Detroit, Michigan

Staff: 23 FT, 7 PT (includes all television staff)

TV teacher	2 FT, 2 PT
Prod-Dir.	3 FT
Engineer	6 FT
Technician	5 PT
Graphics	1 FT
Clerical	10 FT
Students	2 FT
Equipment	
Trans.	2 EMCEE
Down conv.	120 EMCEE & Jerrold
Cameras	5 IO, 3 vidicon
VTR	4
F/S chain	2
Projectors	3 16mm, 1 op., 2 sl.
Description	
Studios	1
Buildings	103
Classrms	2500
Students	108,708
Hrs/week	34.5
Radius	12'
Programming:	25%-50% local

A,B,C,E,I,N

Budget: 62K cap., 137K op.

Capital	62K L.G.
Operating	137K LG

Survey: John F.X. Browne, Jr. and Associates

Originating:

KTB-98				
C-2	7-20-65	11-22-65	8-31-66	(Granted)
C-3	7-20-65	11-22-65	8-31-66	(Granted)

33. Wayne State University
Detroit, Michigan

Staff: 86 FT, 39 PT *

Curr. sp.	2 FT, 1 PT
TV teacher	19 FT, 1 PT
Prod-Dir.	2 FT, 4 PT
Engineer	7 FT, 2 PT
Technician	12 FT, 4 PT
Graphics	4 FT, 2 PT
Clerical	3 FT, 2 PT
Students	18 FT, 20 PT

* Staff of Wayne State Center for Instructional Technology-assigned to 2500 MHz

Equipment

Trans	1 RCA
Down conv	14 RCA
Cameras	14 IO (color) 4 vid.
VTR	28
Kinescope	1
F/S chain	4
Projectors	6 16mm,2op.,8 slide
Mobile vans	2

Description

Studios	3
Buildings	14
Classrooms	28
Students	370
Hrs./week	48
Radius	21'

Budget: 149K cap., 200K op.

Capital	104K FG, 25K SG, 20K college
Operating	150K FG, 10K SG, 20K community, 20K college

Survey: RCA

Originating:

KVP-20
E-1 1-5-67 9-67 6-17-68 (Granted)

34. Independent School District #279
Osseo, Minnesota

Staff: 6 FT, 4 PT	
TV teacher	2 FT, 1 PT
Prod-Dir.	1 FT
Technician	1 FT
Graphics	1 FT
Clerical	1 FT
Students	3 PT
Equipment:	
Trans.	1 Jerrold
Down conv.	12 Jerrold
Cameras	5 vidicon
VTR	9
F/S chain	1
Projectors	2 16mm, 1 op.,1 sl.
Mobile van	
Description:	
Studios	1
Buildings	11
Classrooms	100
Students	8000
Hrs/week	75
Radius	8.8'
Programming:	75+% local
A,B,C,E,I	
Budget: 50K cap., 130K op.	
Capital	50K FG
Operating	100K FG, 30K LG
Survey: Northwest Electronics	

Originating:
KVI-64
A-1 11-8-66 2-67 6-7-67 (Granted)

35. University of Missouri
Columbia, Missouri

Staff:	26 FT, 15 PT
Prod-Dir.	4 FT
Engineer	8 FT
Technician	6 FT
Graphies	2 FT
Clerical	6 FT
Students	15 PT
Equipment	
Trans.	1 Micro-link
Down conv.	4 Micro-link
Cameras	4 vidicon
VTR	53
F/S chain	2
Projectors	1 slide
Mobile unit	
Description	
Studios	1
Buildings	4
Classrooms	83
Students	7800
Radius	14° beam spread, 2000'throw
Programming:	75+% local
B	

Budget: 25,891 cap.
Capital 13,741 FG, 12,150 college

Innovation: Experimentation with reception with video monitors has led to more stable picture and allows for central control of monitors

N.B. 2500 MHz facility is one part of a total system serving 20,000 students. The campus is served by CCTV with ITFS used to relay the internal distribution system to four remote buildings.

Originating:

KXY-61				
C-1	4-24-67	10-10-67	3-20-68	(Granted)
C-2	4-24-67	10-10-67	3-20-68	(Granted)

36. Clark County School District
Las Vegas, Nevada

Staff: 16 FT, 3 PT

Prod-Dir.	3 FT
Engineer	7 FT
Technician	1 FT, 3 PT
Graphics	1 FT
Clerical	3 FT
Students	1 FT

Equipment

Trans.	8 Jerrold
Down conv.	Jerrold
Cameras	6 IO, 4 vidicon (1 color)
VTR	4
F/S chain	2
Mobile van	

Description:

Studios	1
Buildings	75+
Classrooms	1354
Students	35,000-40,000
Hrs/week	60+
Radius	12'

Programming: Under 10% local
A,B,C,E,H,I,J,N

Budget: 300K cap., 200K op.

Capital	300K LG
Operating	200K LG

PI

Innovation: Film scheduling and videotape pick-up at school site

Survey: Hammett and Edison

Originating:

KZH-32			
C-1	11-7-67	1-30-70	1-14-70 (Pending)
C-2	11-7-67	1-30-70	1-14-70 (Pending)
C-3	11-7-67	1-30-70	1-14-70 (Pending)
C-4	11-7-67	1-30-70	1-14-70 (Pending)

Relay:

KZH-33			
E-1	11-7-67	1-30-70	1-14-70 (Pending)
E-2	11-7-67	1-30-70	1-14-70 (Pending)
E-3	11-7-67	1-30-70	1-14-70 (Pending)
E-4	11-7-67	1-30-70	1-14-70 (Pending)

37. Catholic Schools of the Diocese of Brooklyn
Brooklyn, New York

Staff:	20 FT, 4 PT
TV teacher	6 FT, 1 PT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	3 FT, 2 PT
Graphics	1 FT
Clerica	2 FT
Students	3 FT, 1 PT
Ass't P-D	1 FT
Photograph.	1 FT
Utiliz.coor	1 FT
Equipment	
Trans.	16 Micro-link
Down conv.	222 Micro-link
Cameras	2 vid., 3 plumb.
VTR	7
F/S chain	1
Projectors	2 16mm, 1 slide
Mobile unit	
Description	
Studios	1
Buildings	222
Classrooms	2134
Students	195,000
Hrs/week	63
Radius	30'
Programming:	50%

A,B,C,E,H,J,K,M,N

Budget: 1.4 million cap., 225K op.

Capital	1.4 million, diocese
Operating	225K diocese

VTR for redistribution

Innovation: Facsimile transmission, computer applications

Survey: Jules Cohen and Associates

Originating:			
KNZ-60			
B-1	7-28-64	4-16-66	6-7-67 (Granted)
B-2	7-28-64	4-16-66	6-7-67 (Granted)
B-3	7-28-64	4-16-66	6-7-67 (Granted)
B-4	7-28-64	4-16-66	6-7-67 (Granted)
Relay:			
KVX-31			
F-1	2-13-67	9-68	3-20-68 (Granted)
F-2	2-13-67	9-68	3-20-68 (Granted)
F-3	2-13-67	9-68	3-20-68 (Granted)
F-4	2-13-67	9-68	3-20-68 (Granted)
KNZ-70			
F-1	7-28-64	4-18-66	4-17-69 (Granted)
F-2	7-28-64	4-18-66	4-17-69 (Granted)
F-3	7-28-64	4-18-66	4-17-69 (Granted)
F-4	7-28-64	4-18-66	4-17-69 (Granted)
KZE-20			
B-1	10-26-67	9-68	4-16-69 (Granted)
B-2	10-26-67	9-68	4-16-69 (Granted)
B-3	10-26-67	9-68	4-16-69 (Granted)
B-4	10-26-67	9-68	4-16-69 (Granted)

38. Central High School District No. 2
Franklin Square, New York

Staff: 1 FT, 3 PT	
Prod-Dir/Eng	1 FT
Technician	1 PT
Graphics	1 PT
Clerical	1 PT
Equipment	
Trans.	3 Litton, Micro-link
Down conv.	6 Litton, Micro-link
Cameras	7 vidicon
F/S chain	1
Projectors	1 16mm, 1 sl.
Description:	
Studios	1
Buildings	12
Classrooms	250
Hrs,'week	40
Radius	5'
Programming:	75%+ local
A,B,C,H,I	
Budget: 100K capital	
Capital	SG, LG

Originating:

KHD-21			
A-1	3-26-64	10-12-64	1-8-65 (Granted)
A-2	12-22-64	10-12-64	4-15-66 (Granted)
A-3	10-23-69	10-23-69	10-23-69 (Pending)

39. Union Free School District No. 1
Kenmore, New York

Staff: 3 FT, 4 PT

Curr. Sp.	1 PT
Engineer	1 FT
Technician	1 FT
Graphics	1 PT
Clerical	1 FT
Students	1 PT

Equipment

Trans	1 Micro-link
Down conv	3 Micro-link
Cameras	2 vidicon
VTR	2
F/S chain	2
Projectors	3 16mm, 2 sl.

Equipment

Studios	1
Buildings	26
Classrooms	225
Students	22,000
Hrs/week	35
Radius	3'

Programming
A,C,E,H,I,J,N

Budget: 200K cap., 52K op.

Capital	100K SG, 100K LG
Operating	15,600 SG, 36,400 LG

VTR for redistribution
Survey: Micro-link

Originating:

KWE-21				
A-1	6-26-69	2-2-70	12-30-69	(Pending)
A-2	6-26-69	2-2-70	12-30-69	(Pending)

40. Union Free School District No. 10
Mineola, New York

Staff: 4 FT, 12+ PT	
Curr. Sp.	1 FT
Prod-Dir.	1 FT
Engineer	1 FT
Graphics	2 PT
Clerical	1 FT
Students	10 PT
Equipment	
Trans.	4 Micro-link, Adler
Down conv.	6 Micro-link
Cameras	3 vidicon
VTR	7
F/S chain	1
Projectors	1 slide
Description	
Studios	1
Buildings	7
Classrooms	253
Students	5000
Hrs/week	60
Radius	3'
Programming:	25%-50% local

A,B,C,D,E,H,I,J,N

Budget: 370K cap., 102K op.

Capital	100K SG, 270K LG
Operating	10K SG, 92K, LG

Innovation: Individualized instruction via ITFS facility
VTR for redistribution
Survey: New York State Education Department

Originating:

KNZ-71			
G-1	7-28-64	2-65	3-31-65
G-2	7-28-64	2-65	3-31-65
G-3	4-3-69	3-70	
G-4	4-3-69	3-70	

41. Archdiocese of New York (City)
Yonkers, New York

Staff:	10 FT, 8 PT
Curr.sp.	2 FT, 2 PT
Prod-Dir.	1 FT, 1 PT
Engineer	1 FT
Technician	2 FT, 3 PT
Graphics	1 PT
Clerical	3 FT, 1 PT
Equipment	
Trans.	21 Varian, Micro-link
Down conv.	256 Varian,Micro-link
Cameras	3 IO, 4 vidicon
VTR	6
F/S chain	3
Projectors	1 16mm, 1 slide
Other	12-GHz microwave trans. 12-Ghz microwave rec'rs
Description:	
Studios	2
Buildings	256
Classrooms	2048
Students	136,591
Hrs/week	120
Radius	4000 sq.mis.
Programming:	10%-25% local
A,B,C,E,G,H,I,J,K,M,N	
Budget:	2.5 million cap., 275K op.
Capital	2.5 million, diocese
Operating	275K diocese
VTR for redistribution	
Survey:	RCA, Paul Godley Associates

Originating

KRS-81			
A-1	1-29-65	9-28-66	11-7-67 (Granted)
A-2	1-29-65	9-28-66	11-7-67 (Granted)
A-3	1-29-65	9-28-66	11-7-67 (Granted)
KRS-86			
A-1	1-29-65	9-28-66	11-7-67 (Granted)
A-2	1-29-65	9-28-66	11-7-67 (Granted)
A-3	1-29-65	9-28-66	11-7-67 (Granted)
KRW-67			
A-1	3-15-65	9-28-66	11-7-67 (Granted)
A-2	3-15-65	9-28-66	11-7-67 (Granted)
A-3	3-15-65	9-28-66	11-7-67 (Granted)
KRS-84			
A-1	1-29-65	9-28-66	11-7-67 (Granted)
A-2	1-29-65	9-28-66	11-7-67 (Granted)
A-3	1-29-65	9-28-66	11-7-67 (Granted)
KRS-82			
E-1	1-29-65	9-28-66	11-7-67 (Granted)
E-2	1-29-65	9-28-66	11-7-67 (Granted)
E-3	1-29-65	9-28-66	11-7-67 (Granted)
KRS-83			
E-1	1-29-65	9-28-66	11-7-67 (Granted)
E-2	1-29-65	9-28-66	11-7-67 (Granted)
E-3	1-25-65	9-28-66	11-7-67 (Granted)
KRS-85			
E-1	1-29-65	9-28-66	11-7-67 (Granted)
E-2	1-29-65	9-28-66	11-7-67 (Granted)
E-3	1-29-65	9-28-66	11-7-67 (Granted)

C.P. granted - not on air

KWE-22	
E-1	6-26-69
E-2	6-26-69
E-3	6-26-69

42. Newburgh City School District
Newburgh, New York

Staff: 4 FT, 9 PT	
Curr. sp.	1 FT
TV teacher	3 PT
Prod-Dir.	1 FT
Engineer	1 FT
Clerical	1 FT
Students	6 PT
Equipment	
Trans.	2 Micro-link
Down conv	17 Micro-link
Cameras	2 vidicon
VTR	3
F/S chain	1
Projectors	3 16mm, 1 sl.
Description	
Studios	1
Buildings	17
Classrms	200
Students	10,000
Hrs/week	20
Radius	4.9'
Programming:	10%-25% local
A,C,E,G,H,I,J,N	
Budget: 165K cap., 60K op.	
Capital	165K FG
Operating	60K FG
PI	

Originating

KTN-66			
D-1	7-28-65	9-66	6-7-67 (Granted)
D-2	7-28-65	9-66	6-7-67 (Granted)

43. Plainedge Public Schools
North Massapequa, Long Island, New York 11761

Staff: 2 FT, 2 PT	
TV teacher	1 PT
Prod-Dir.	1 FT
Engineer	1 FT
Clerical	1 PT
Equipment	
Trans.	1 Adler
Down conv.	12 Adler
Cameras	4 vidicon
VTR	2
F/S chain	1
Projectors	1 16mm, 1 op.,1 sl.
Mobile unit	
Description	
Studios	1
Buildings	9
Classrooms	180
Students	8000
Hrs/week	30
Radius	3'
Programming:	Under 10% local
A,C,G,N	
Budget: 140K cap., 58K op.	
Community	140K
Community	58K

VTR for redistribution
PI
Survey: Adler

N.B. Tie-line between Plainedge system and Plainview system

Originating

KNU-43
D-1 5-21-64 6-62* 1-8-64 (Granted)
11-12-64

* Operating on experimental 2000 MHz permit.

44. Central School Distrct No. 4
Plainview, New York 11803

Staff: 2 FT, 21 PT	
Curr. Sp.	1 PT
TV teacher	10 PT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	3 PT
Graphics	2 PT
Clerical	1 PT
Students	4 PT
Equipment	
Trans.	1 Micro-link
Down conv.	23 Micro-link
Cameras	7 vidicon
VTR	2
F/S chain	1
Projectors	2 16mm, 1 opaque,1 sl.
Mobile unit	
Description	
Studios	2
Buildings	23*
Classrooms	490*
Students	15,000*
Hrs/week	25
Radius	5'

* Figures include Plainedge and Bethpage districts

Programming: 10%-25% local
C,E,H,N

Budget: 150K cap., 25K op.

Capital	150K FG
Operating	25K LG

Survey: Micro-link Varian Associates

Originating:

KHC-94			
B-1	2-17-64	9-28-65	11-24-65 (Granted)

45.Diocese of Rockville Center
Uniondale, New York

Staff: 13 FT, 6 PT	
Curr.Sp.	4 FT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 FT
Clerical	4 FT
Students	6 PT
Equipment	
Trans	4 Jerrold
Down conv	77 Jerrold
Cameras	5 plumbicon
VTR	4
F/S chain	2
Projectors	2 16mm, 2 sl.
Description	
Studios	2
Buildings	77
Classrooms	700
Students	65,000
Hrs/week	30
Radius	35'-40'
Programming:	Under 10% local
A,B,C,E,J,K,M,N	
Budget: 2 million cap., 250K op.	
Capital	2 million, diocese
Operating	250K diocese
EVR	
Survey: Jules Cohen and Associates	

Originating:

KNZ-65				
E-1	7-28-64	2-16-70	4-1-70	(Granted)
E-2	7-28-64	2-16-70	4-1-70	(Granted)
E-3	7-28-64	2-16-70	4-1-70	(Granted)
E-4	7-28-64	2-16-70	4-1-70	(Granted)

Construction permits - not on air:

KNZ-68	
D-1	7-28-64
D-2	7-28-64
D-3	7-28-64
D-4	7-28-64
KNZ-67	
A-1	7-28-64
A-2	7-28-64
A-3	7-28-64
A-4	7-28-64

46. Rochester Institute of Technology
Rochester, New York

Staff:	8 FT, 22 PT
TV teacher	2 PT
Prod-Dir.	2 FT
Engineer	2 FT
Technician	1 FT, 3 PT
Graphics	1 FT
Clerical	2 FT, 1 PT
Students	15 PT
Equipment	
Trans.	1 RCA
Down conv.	5 RCA, Micro-Link
Cameras	3 IO, 4 vidicon
VTR	5
F/S chain	2
Projectors	2 16mm, 2 slide
Description	
Studios	2
Buildings	14
Classrooms	35
Students	100
Hrs/week	15o
Radius	90
Programming:	Under 10% local
B,D	
Budget:	80K cap., 22K op.
Capital	40K SG, 40K college
Survey:	William J. Kessler

Originating:

WAX-30
A-1 5-15-69 11-17-69 12-4-69 (Pending)

47. City School District of Rochester
Rochester, New York

Staff: 3 FT, 2 PT

Curr. Sp.	1 FT
Engineer	2 FT
Clerical	1 PT
Students	1 PT

Equipment:

Trans.	2 Micro-link
Down conv.	60 Micro-link
Cameras	3 IO, 8 vid.
VTR	7
F/S chain	3
Projector	3 16mm,1 op.,2 sl.
Mobile unit	

Description:

Studios	1
Buildings	60
Classrooms	1200
Radius	7'

Programming: Under 10% local
N.A.

Budget: 1 million cap, 67 K op.

Capital	500K SG, 500K LG
Operating	67K - project contract

Innovation: Pilot project for New York State Education Department involving total television teaching, 5th grade, 1/2 day blocks.

Originating

KRV-45			
D-1	3-10-65	12-65	4-15-66 (Granted)
D-2	3-10-65	12-65	4-15-66 (Granted)
D-3	3-10-65	12-65	4-15-66 (Granted)

48. Duke University Medical Center
Durham, North Carolina

Staff: 6FT, 5PT	
TV teacher	10 PT
Prod.-Dir.	1 FT, 1 PT
Engineer	1 FT
Technician	4 FT, 1 PT
Graphics	2 PT
Clerical	1 PT
Equipment	
Trans.	2 Micro-link
Down conv.	2 Micro-link
Cameras	2 IO, 6 vid.
VTR	8
F/S chain	2
Projectors	2 16mm,1 op,2 sl
Mobile unit	2
Description	
Studios	2
Buildings	4
Classrooms	20
Students	600
Hrs/week	10
Radius	15'
Programming:	75+% local

A,B,C,G,H,I,J,N

Budget: 27,700 cap., 65,000 op.

Capital	24,700 FG, 1500 SG, 1500 LG
Operaging	65,000 FG

VTR for redistribution

Survey: Duke University Engineering Department

N.B. CCTV system operating for ten years; ITFS activated in March 1970.

Originating:

KCO-55		
G-1	9-10-69	4-70
G-2	9-10-69	4-70
KCO-86		
C-1	9-10-69	4-70
C-2	9-10-69	4-70

49. University of Cincinnati
Cincinnati, Ohio

Staff: 14 FT	
Prod-Dir.	1 FT
Engineer	1 FT
Technician	5 FT
Graphics	3 FT
Clerical	2 FT
Students	2 FT
Equipment	
Trans.	1 Jerrold
Down conv.	1 Jerrold
Cameras	15 vidicon
VTR	10
F/S chain	1
Projectors	5 16mm,2 op.,10 sl.
Description	
Studios	2
Buildings	5
Hrs/week	12
Radius	20'
Programming:	50%-75% local
C,E	
Budget: 15K cap.	
Capital	15K college

VTR for redistribution
Survey: Self

Originating:

KHX-47		
A-1	8-1-69	3-4-70

50. Educational Television Association of Metropolitan Cleveland
Cleveland, Ohio

Staff:* N.A. Producer-director, Engineer and technicians from WVIZ staff as needed. Members will provide individual staff.

Originating:
KDX-68
E-1 10-2-69 2-19-70

Equipment: (All owned by WVIZ) *

Trans.	2 Jerrold
Cameras	4 IO, 2 plumb.
VTR	7
F/S chain	2
Projectors	2 16mm, s sl.

Description:*

Studios	2
Buildings	25
Classrooms	200
Students	25,000
Radius	22'

Programming:* N.A.
Budget:* 60,000 community capital
Operating budget based on use.
Survey: Janskey and Bailey
John F. X. Browne Associates

* These figures are not tabulated in summary presented in Chapter VI.

51. Parma City Schools*
Parma, Ohio

Staff: 5 FT, 9 PT	
TV teacher	1 FT, 3 PT
Prod-Dir	1 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 PT
Clerical	1 PT
Students	4 PT
Equipment	
Trans.	1 Micro-link
Down conv.	27 Chester
Cameras	5 vidicon
VTR	3
F/S chain	1
Projectors	1 16mm, 1 sl.
Description:	
Studios	1
Buildings	30
Classrooms	210
Students	25,000
Hrs/week	43
Radius	4'
Programming:	75+% local
A,B,C,E,G,H,I,J,N	
Budget: 200K cap., 90K op.	
Capital	200K community
Operating	90K community

PI
Survey: Jansky and Bailey

Originating:

KNZ-60
A-1 6-26-64 9-28-64 9-28-64 (Granted)

See also #50, Educational Television Association of Metropolitan Cleveland

52. Umatilla County Intermediate Educational District
Pendleton, Oregon 97801

Staff: 2 FT, 2 PT	
Prod-Dir.	1 PT
Technician	2 FT
Clerical	1 PT
Equipment	
Trans.	5 EMCEE
Down conv.	45 EMCEE
Cameras	1 Vidicon
VTR	4
F/S chain	1
Projectors	1 16mm, 1 sl.
Mobile unit	
Description:	
Studios	1
Buildings	43
Classrms	100
Students	3000
Hrs/week	30
Radius	75'
Programming:	Under 10% local
A,C,E,I,N	
Budget: 200K cap., 35K op.	
Capital	200K FG
Operating	35K LG

Survey: George Freeze, Consulting Engineer

Originating:			
KYZ-44			
A-1	6-19-67	10-68	10-6-69 (Granted)
Relay:			
KYL-45			
F-1	6-19-67	10-68	10-6-69 (Granted)
KYL-46			
B-1	6-19-67	10-68	10-6-69-(Granted)
KYL-47			
E-1	6-19-67	10-68	10-6-69 (Granted)
KMA-20			
E-1	9-16-67	10-69	10-6-69 (Granted)

53. Altoona Area School District
Altoona, Pennsylvania

Staff:	7 FT, 30 PT
Curr. spec.	14 PT
TV teacher	2 FT
Prod-Dir.	1 FT, 1 PT
Engineer	1 FT
Technicial	1 FT, 1 PT
Graphics	1 FT
Clerical	1 FT
Students	14 PT
Equipment	
Trans.	4 Micro-link
Down conv.	44 Micro-link
Cameras	4 vidicon
VTR	7
F/S chain	1
Projectors	1 op., 4 sl.
Description:	
Studios	1
Buildings	40
Classrms	450
Students	17,000
Hrs/week	48
Radius	6'
Programming:	50%=75% local

A,C,E,G,H,I,N

Budget: 300K cap., 75K op.

Capital	250K FG, 50K LG
Operating	37,500 FG, 37,500 LG

VTR for redistribution
Survey: Varian Associates

Originating:				
KVQ-25				
A-1	1-18-67	5-67	3-20-68	(Granted)
A-2	1-18-67	5-67	3-20-68	(Granted)
A-3	1-18-67	5-67	3-20-68	(Granted)
A-4	1-18-67	5-67	3-20-68	(Granted)
Relay:				
KCG-49				
G-1	4-11-68	10-68	12-11-68	(Pending)
KZC-21				
G-1	10-16-67	9-69	5-21-69	(Pending)
G-2	10-16-67	9-69	5-21-69	(Pending)
G-3	10-16-67	9-69	5-21-69	(Pending)
G-4	10-16-67	9-69	5-21-69	(Pending)
KZC-22				
G-1	10-16-67	9-69	5-21-69	(Pending)
G-2	10-16-67	9-69	5-21-69	(Pending)
G-3	10-16-67	9-69	5-21-69	(Pending)
G-4	10-16-67	9-69	5-21-69	(Pending)

54. Hanover Borough School District
Hanover, Pennsylvania

Staff: 2 FT, 5+ PT	
Curr. sp.	1 PT
TV teacher	1 PT
Prod-Dir.	1 PT
Engineer	1 FT
Graphics	1 PT
Clerical	1 FT
Students	4 PT
Equipment	
Trans.	1 Micro-link
Down conv.	28 Micro-link
Cameras	3 vidicon
VTR	4
F/S chain	1
Projectors	1 16mm, 1 op.,1 sl.
Description:	
Studios	1
Buildings	28
Classrooms	150
Students	13,000
Hrs/week	5.5
Radius	13'
Programming:	10%-25% local
A,C,E,N	
Budget: 145K cap., 14K op.	
Capital	115K FG, 30K LG
Operating	14K LG

PI
Survey: Jack Rickel Associates

Originating:			
KZB-21			
B-1	9-13-67	2-27-68	12-27-68(Pending)
B-2	9-13-67	2-27-68	12-27-68(Pending)
Relay:			
KZB-20			
F-1	9-21-67	2-26-68	5-29-68 (Pending)
F-2	9-21-67	2-26-68	5-29-68 (Pending)

55. Mifflin County School District
Lewiston, Pennsylvania 17044

Staff: 5 FT, 18 PT	
TV teacher	1 PT
Prod-Dir	1 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 PT
Clerical	1 FT
Students	16 PT
Equipment	
Trans	8 Micro-link
Down conv.	29 Micro-link
Cameras	7 vidicon
VTR	3
F/S chain	2
Projectors	4 16mm,1 op.,1 sl.
Description	
Studios	1
Buildings	25
Classrms	420
Students	10,000
Hrs/week	100
Radius	14'
Programming:	Under 10% local
A,C,E,I,J,N	
Budget: 300K cap., 100K op.	
Capital	300K FG
Operating	100K FG

PI

Innovation: Simulated programmed learning formats for education and training of parents

Originating:

KHU-20				
A-1	6-3-66	12-29-66	3-29-68	(Granted)
A-2	6-3-66	12-29-66	3-29-68	(Granted)
A-3	6-3-66	12-20-66	3-29-68	(Granted)
A-4	6-3-66	12-29-66	3-29-68	(Granted)
KHU-21				
E-1	6-3-66	1-16-67	3-29-68	(Granted)
E-2	6-3-66	1-16-67	3-29-68	(Granted)
E-3	6-3-66	1-16-67	3-29-68	(Granted)
E-4	6-3-66	1-16-67	3-29-68	(Granted)

56. Temple University
Philadelphia, Pennsylvania

Staff:	11 FT, 25 PT
Prod-Dir	3 FT, 3 PT
Engineer	4 FT
Graphics	1 FT
Clerical	1 FT, 2 PT
Students	25 PT
Equipment	
Trans	2 Jerrold
Down conv.	5
Cameras	3 IO, 5 vid.
VTR	5
F/S chain	2
Projectors	2 16mm, 2 sl.
Mobile unit	
Description	
Buildings	5
Classrooms	200
Radius	20'
Programming:	75% local
Budget:	80K cap., 8K op.
Capital	80K college
Operating	8K college

PI
EVR
Innovation: Minority education, industrial involvement
Survey: Jansky and Bailey.

Originating:

WAU-28		
E-1	5-8-69	1-8-70
E-2	5-8-69	1-8-70

57. Centennial School District
Warminster, Pennsylvania

Staff: 1 FT, 14 PT	
Technician	1 FT
Graphics	1 PT
Clerical	1 PT
Students	12 PT
Equipment	
Trans.	1 Jerrold
Down conv	5 Jerrold
Cameras	3 vidicon
VTR	3
F/S chain	1
Projectors	1 16mm, 1 op., 2 sl.
Mobile unit	
Description:	
Studios	1
Buildings	6
Classrooms	117
Radius	5'
Budget:	105K cap., 20K op.
Capital	20K FG, 10K SG, 75K LG
Operating	20K LG

VTR for redistribution
EVR
Survey: Jerrold

Originating

KOU-74
G-1 12-11-68 12-29-69 12-29-69 (Pending)

58. Weakley County Board of Public Instruction
Martin, Tennessee

Staff: 25 FT, 36 PT	
Curr. Sp.	2 FT, 12 PT
TV teacher	11 FT, 1 PT
Prod-Dir.	3 FT, 1 PT
Engineer	2 FT
Technician	4 FT
Graphics	2 FT
Clerical	2 FT, 2 PT
Students	20 PT
Equipment	
Trans.	18 EMCEE
Down conv.	70 Jerrold, EMCEE
Cameras	3 vidicon
VTR	3
F/S chain	2
Projectors	3 16mm
Description	
Studios	2
Buildings	90
Classrooms	1000
Students	45,000
Hrs/week	60
Radius	5000 sq.mi.
Programming:	75+% local
A,B,C,E,J	
Budget: 883K cap., 293K op.	
Capital	283K FG, 200K SG, 300K LG
Operating	280K FG, 10K LG, 3K college
Survey: Self	

Originating:				
KIK-50				
C-1	6-14-68	12-15-68	4-23-69	(Granted)
C-2	6-14-68	12-15-68	4-23-69	(Granted)
C-4	6-14-68	12-15-68	4-23-69	(Granted)
Relay:				
KIK-53				
C-1	6-14-68	12-15-68	4-23-69	(Granted)
C-2	6-14-68	12-15-68	4-23-69	(Granted)
C-4	6-14-68	12-15-69	4-23-69	(Granted)
KIK-79				
C-1	6-14-68	12-15-68	4-23-69	(Granted)
C-2	6-14-68	12-15-68	4-23-69	(Granted)
C-4	6-14-68	12-15-68	4-23-69	(Granted)
KIN-53				
A-1	6-14-68	12-15-68	4-23-69	(Granted)
A-2	6-14-68	12-15-68	4-23-69	(Granted)
A-4	6-14-68	12-15-68	4-23-69	(Granted)
KIK-52				
A-1	6-14-68	12-15-68	4-23-69	(Granted)
A-2	6-14-68	12-15-68	4-23-69	(Granted)
A-4	6-14-68	12-15-68	4-23-69	(Granted)
KIK-78				
E-1	6-14-68	12-15-68	4-23-69	(Granted)
E-2	6-14-68	12-15-68	4-23-69	(Granted)
E-4	6-14-68	12-15-68	4-23-69	(Granted)

59. Brazosport Independent School District
Freeport, Texas

Staff:	3 FT, 1 PT
Curr.sp.	1 FT
Technician	1 FT
Clerical	1 FT
Students	1 PT
Equipment	
Trans.	2
Down conv.	15
Cameras	2 vidicon
VTR	3
F/S chain	2
Projectors	1 sl.
Description:	
Studios	2
Buildings	15
Classrooms	245
Students	10,000
Hrs/week	70-75
Radius	12'
Programming:	Under 10% local
A,C,E,I,J	
PI	

Survey: Taft Broadcasting, Inc., Houston, Texas

Originating:

KHU-92			
D-1	8-1-66	12-66	6-7-67 (Granted)
D-2	8-1-66	12-66	6-7-67 (Granted)

60. Spring Branch Independent School System
Houston, Texas

Staff: 7 FT, 2 PT

Curr.Sp.	1 FT
TV teacher	1--15 PT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	2 FT
Graphics	1 FT
Clerical	1 FT
Students	2 FT

Equipment

Trans.	2 Micro-link
Down conv.	32 Micro-link,Jerrold
Cameras	2 vidicon
VTR	4
F/S chain	3
Projectors	3 16mm, 1 slide

Description:

Studio	1
Buildings	32
Classrms	600
Students	32,000
Hrs/week	75
Radius	10'

Programming: 50%-75% local
A,B,C,E,H,I,J,N
Budget: 500K cap., 72K op.
Capital 500K LG
Operating SG, LG
VTR for redistribution
Innovation: Open-ended programs and activities
Survey: H.C. Will

Originating:

KRZ-68				
D-1	4-20-65	9-7-65	5-31-66	(Granted)
D-2	4-20-65	9-7-65	5-31-66	(Granted)

61. Mesquite Independent School District
Mesquite, Texas

Staff: 8 FT, 18 PT

TV teacher	3 FT
Prod-Dir.	1 FT
Engineer	1 FT
Technician	1 FT
Graphics	1 FT
Clerical	1 FT
Students	18 PT

Equipment

Trans.	3 Micro-link
Down conv.	22 Micro-link
Cameras	6 vidicon
VTR	3
F/S chain	2
Projectors	2 16mm,1 op.,5 sl.
Mobile unit	

Description:

Studios	4
Buildings	21
Classrms	740
Students	18,000
Hrs/week	50
Radius	12'

Programming: 50%-75% local
A,C,D,E,G,H,I,J,N
Budget: 135K cap., 121,733 op.

Capital	100K FG, 30K SG, 5K community
Operating	75,468 FG, 11,265 SG, 35,000 community

Originating:

KHS-78

D-1	5-26-66	3-1-68	6-7-67	(Pending)
D-2	5-26-66	3-1-68	6-7-67	(Pending)
D-3	5-26-66	3-1-68	6-7-67	(Pending)

62. Edgewood Independent School District
San Antonio, Texas

Staff:	6 FT, 22 PT
Curr.sp.	5 PT
TV teacher	4 PT
Prod-Dir.	1 PT
Engineer	1 FT
Technician	2 FT
Graphics	1 FT
Clerical	1 FT
Students	12 PT
Equipment	
Trans.	2 EMCEE
Down conv.	21 EMCEE,Jerrold
Cameras	5 vidicon
VTR	5
F/S chain	1
Projectors	1 16mm, 1 sl.
Description:	
Studios	1
Buildings	26
Classrooms	775
Students	23,000
Hrs/week	39
Radius	5'
Programming:	75+% local
A,B,C,E,G,H,N	

Budget: 125K cap., 95K op.

Capital	30K FG, 95K LG
Operating	65K FG, 15K SG, 15K LG

Innovation: Bi-lingual education for Mexican American students via ITFS
Survey: Taft Broadcasting Company, Houston, Texas

Originating:

KHS-77				
D-1	5-26-66	10-19-66	6-7-67	(Granted)
D-2	5-26-66	10-19-66	6-7-67	(Granted)
D-3	5-26-66	10-19-66	6-7-67	(Granted)

63. Marquette University
Milwaukee, Wisconsin

Staff: 1 FT, 9 PT + director	
Prod-Dir	1 PT
Engineer	1 FT, 1 PT
Graphics	1 PT
Clerical	1 PT
Students	5 PT
Equipment	
Trans.	1 RCA, Micro-link
Down conv.	4
Cameras	3 vidicon
VTR	2
F/S chain	1
Projectors	1 16mm, 1 sl.
Description	
Studios	2
Buildings	4
Classrooms	40
Radius	10'
Programming:	75+% local
A,B,C,D,E,H,I,K,N	
Budget: 30K cap., 10K op.	
Capital	10K FG,20 K college
Operating	10K college
PI	
Survey: RCA	

Originating:

KVW-78			
A-1	3-16-67	4-1-69	4-1-69 (Pending)
A-2	3-16-67	4-1-69	4-1-69 (Pending)

64. Milwaukee Regional Medical Instructional TV Stations, Inc.
Milwaukee, Wisconsin

Staff: 1 FT, 11+ PT
  Curr. sp. 1 PT
  Prod-Dir. 1 PT
  Engineer 1 FT
  Technician 3 PT
  Graphics 3 PT
  Clerical 3 PT
Equipment
  Trans 1 Jerrold
  Down conv. 10 Jerrold
  Cameras 6 vid., 1 plumb.
  VTR 4
  Kinescope 1
  F/S chain 1
  Conference phone system
Description
  Studios 8 (operating rms, morgue, clinic)
  Buildings 10
  Classrooms 30
  Hrs/week 4-6
  Radius 10'
Programming: 25% local
  A,C,E,H,I,K,L,M,N
Budget: 460K cap., 72K op.
  Capital 380K FG, 80K community
  Operating 35K FG, 33K community, 4K college
VTR for redistribution
Survey: RCA and Jerrold

Originating:

WAV-27
  E-1 5-7-69 2-23-70 2-20-70 (Pending)

65. Archdiocese of Milwaukee
Milwaukee, Wisconsin

Staff:	9 FT, 15 PT
Curr. sp.	2 FT
TV teacher	10 PT
Prod-Dir.	1 FT
Engineer	3 FT, 1 PT
Graphics	2 PT
Clerical	1 FT
Students	2 PT
Equipment	
Trans.	5 Micro-link, Jerrold
Down conv.	102 Micro-link, Jerrold
Cameras	2 vidicon
VTR	4
F/s chain	1
Projectors	2 16mm, 1 slide
Description:	
Studios	1
Buildings	102
Classrooms	1200
Students	43,000
Hrs/week	70
Radius	80'
Programming:	10%-25% local
A,B,C,D,E,I,J,M,N	

VTR for redistribution
PI
Survey: Video Systems, Chicago, Illinois

Originating:

KZB-27				
G-1	9-13-67	9-14-68	9-12-68	(Pending)
G-2	9-13-67	9-14-68	9-12-68	(Pending)

Relay:

KZH-34				
G-1	11-7-67	9-14-68	9-12-68	(Pending)
G-2	11-7-67	9-14-68	9-12-68	(Pending)
KZH-35				
C-1	11-7-67	12-12-69	1-29-70	(Pending)
C-2	11-7-67	12-12-69	1-29-70	(Pending)

CP's granted - not on air:

KZB-27		KZH-40	
G-3	9-13-67	C-1	11-7-67
G-4	9-13-67	C-2	11-7-67
KZH-39		C-3	11-7-67
G-1	11-7-67	C-4	11-7-67
G-2	11-7-67	KZH-35	
G-3	11-7-67	C-3	11-7-67
G-4	11-7-67	C-4	11-7-67
KZH-36		KZH-34	
G-1	11-7-67	C-3	11-7-67
G-2	11-7-67	C-4	11-7-67
G-3	11-7-67	KZH-38	
G-4	11-7-67	G-1	11-7-67
KZH-37		G-2	11-7-67
C-1	11-7-67	G-3	11-7-67
C-2	11-7-67	G-4	11-7-67
C-3	11-7-67		
C-4	11-7-67		

PART III

CONCLUSIONS

I. When the Federal Communications Commission authorized the reservation of the 2500-2690 MHz range for Instructional Television Fixed Service the action was taken without firm foundation on which to evaluate either the technical capability of the system or the ultimate needs of education for this on-air closed-circuit distribution service. Five years of field experience indicate that, as a technical entity, ITFS is a practical and reliable method of communication which offers significant advantages in terms of instructional capability and basic economies in terms of spectrum conservation.

   A. The technical limitations of low power and limited range can be compensated for in large part by the careful engineering and effective coordination among users inherent in the original design of ITFS.

      1. The technical efficiency and reliability of a local ITFS system depend on sound and impartial engineering advice combined with high quality component equipment throughout the system. Systems so designed and constructed have proved to provide high quality reception, reliable performance and economical construction and operation.

2. Effective regional development involves extensive communication among potential users, cooperative planning, and a means of enforcing the best interests of the region over short-range self interests of individual installations. Various forms and degrees of regional development have been explored and explained in this study.

B. The essential engineering design of ITFS incorporates elements of significant advantage to education:

1. As a medium of instruction ITFS provides the essential features of multi-channel capability, freecom for experimentation, local control and economu.
2. Although the primary purpose of ITFS is direct instruction, licensees may also use their facilities for transmission of administrative material, informal instruction and special training material.
3. ITFS complements other aspects of educational telecommunication, including broadcast ITV, closed-circuit television and microwave relay.

C. The May 1969 authorization by the FCC of audio response stations, and the March 1970 extension of the authorization to include transmission of data signals within the 2686-2690 MHz range establish ITFS as a unique system of two-way telecommunication. These response channels offer unprecedented opportunities for two-way voice and data communication ranging from simple talk-back to push button servicing, response evaluation systems and computer-assisted instruction.

D. New techniques of telecommunication, including satellite communication and microwave common carriers, may be used to distribute ITFS signals beyond the present local distribution range.

II. For a variety of reasons education has not yet capitalized on the full and unique potential of ITFS:

A. ITFS, which required new engineering techniques unfamiliar to engineers, was in some instances sold as an operational entity before the industry was operational technically. Systems designed on the basis of manufacturers' engineering estimates caused subsequent disappointment on the part of some users with the technical capability and reliability of the 2500 MHz equipment. Thus, the early growth of ITFS was inhibited by poorly designed transmitting and receiving equipment and by exaggerated claims from manufacturers of low cost and extended range capability.

B. Some applications of ITFS reflect the apparent reluctance of educators to make a commitment to the use of instructional television. When instructional television is regarded as a teaching aid, supplementary rather than complementary to the role of the classroom teacher, it cannot be justified on a cost-effective basis. Instructional television, when not employed in the resolution of the real problems of education, is ancillary to the direct instructional process. The attitude of educational administrators towards instructional television is reflected in financial commitment on the part of the community served, in the placement of instructional television within the administrative structure, in the allocation of personnel to the development of instructional television programming, and in the integration of the medium of television into learning strategies.

C. Many administrators and educators have failed to understand the distinction between television as a medium and 2500 MHz television as one method of television distribution.

1. As a result, some ITFS systems have been conceived as low-cost broadcast systems, developed in competition with and in the image of broadcast television. Emphasis on economy and local control has produced short-range planning which overlooked basic instructional goals, the primacy of programming and the necessity of careful engineering design both to insure local efficiency and to avoid interference with regional plans for the development of ITFS.
2. In some instances, outside funding or one-time appropriations deferred from previous support of broadcast ETV, provided the capital investment for

ITFS equipment with no concomitant local commitment to long-range support of an instructional television program.

D. A stereotype conception of instructional television, based on the traditional public broadcast image, has inhibited full development of the unique characteristics of ITFS for experimentation with the medium itself. In part, this fact may be overcome as systems become more familiar with the medium and are able to concentrate more on creative application of ITFS.

1. ITFS has been used primarily for the distribution of existing or traditional program materials.
2. With some exceptions, ITFS distribution has been limited to traditional classrooms.
3. Again with exceptions, ITFS distribution has been limited to instructional materials, with very little application of the medium in the solution of administrative problems.

E. The educational community has developed no effective organization to support the systematic development of ITFS. There is no comprehensive vehicle for expansion of ITFS through the exchange of information among potential and present users, through the development of criteria for ITFS systems design, through communication among in-school educators and administrators, educational broadcasters, the FCC and producers of equipment. With the exception of some well-organized local and regional groups, and interest groups such as the diocesan school systems, educators involved in ITFS are working in isolation, to the detriment of local systems as well as to the national development of ITFS in concert with other aspects of educational telecommunications.

F. The FCC, as the agency directly responsible for ITFS, has not fulfilled its responsibility "to foster the expanded use of the radio frequency spectrum to the public interest, convenience, and necessity."

   1. The Committee for the Full Development of ITFS, established by the Commission in 1965, is an ineffective organ for communication between the Commission and education. The Committee, composed primarily of educational broadcasters and administrators, has no legal authority, dubious responsibilities, no financial support, no staff, and an inefficient organizational structure. Furthermore, the opinion of the Committee or its members has not been sought on several issues of concern to the development of ITFS. Many specific recommendations from the Committee have not been implemented.

2. In processing applications and correspondence from educational interests the Commission has not acknowledged constraints of time and budget that affect local institutions and systems. Delays in processing applications cause severe problems to applicants at the local level.
3. Lack of coordination among FCC staff members and representatives of the educational community cause confusion and misinformation regarding the status of ITFS, of individual ITFS systems and of applications from non-instructional users of the 2500-2690 MHz band.
4. The Commission has restrained local initiative by placing restrictions on experimentation with innovative applications of ITFS at the local level.
5. To date the Commission has not conducted the three-year review of the use by education of the 2500-2690 MHz band which was stipulated in the original rule making on Docket 14744 in 1963. Without such a review the Commission cannot address itself to the regularization of ITFS which is prerequisite to systematic development of this portion of the radio spectrum.

RECOMMENDATIONS

I. That agencies concerned with the development of ITFS consider non-traditional organizational patterns to facilitate the systematic growth of 2500 MHz television on a regional basis. Organizational possibilities include cooperative agreements among school districts, co-institutional arrangements such as the college-level relationships described, pooling of channel allocations in a community educational television consortium such as that now beginning in Cleveland, and community coordination of all levels of telecommunication, including non-educational groups, with a consortium of interests, instructional and non-instructional, sharing the 2500-2690 MHz band.

II. That the responsibility for the dissemination of information about ITFS and for coordination of the development of ITFS, be placed with an agency outside of the FCC. The present Committee for the Full Development of ITFS is severely restricted in its activities by its structure, its established purpose and its relationship with the federal agency. The systematic development of ITFS, the incorporation with ITFS systems of sophisticated engineering techniques, and the application of ITFS in the solution of the real needs of education require forceful, knowledgeable and effective leadership.

III. That the FCC consider specific changes in its policies relating to ITFS:

A. That the Committee for the Full Development of ITFS, if it is to be retained, be re-organized, funded and extended authority and status as an advisory body, that it be composed of representatives of all groups interested in the development of the 2500-2690 MHz band, and that its title be changed to incorporate the full potential and the specific perspective of this medium of communication.

B. That the Commission adjust its procedures in light of budgeting and planning realities inherent to education, particularly to public education.

C. That the Commission clarify the terminology regarding ITFS systems, stations and channels to eliminate ambiguities and misinformation regarding the nature and scope of individual systems and the quantitative development of ITFS.

D. That the Commission avert inevitable problems of interference and spectrum saturation before they arise by:

1. Exercising its authority to impose more stringent technical restrictions on ITFS facilities, to insure power limitations, employment of interference prevention techniques and other technical standards.

2. Reviewing applications from prospective ITFS licensees to determine their proposed development of ITFS in reference to the best interests of the community to be served. While priorities such as those proposed by some members of the Committee for the Full Development of ITFS are arbitrary and unnecessarily restrictive, potential licensees, without regard to academic classification, could be required by the Commission to indicate how they will serve community over institutional interests. Restrictions such as those placed on public broadcasting applications could be extended to ITFS applicants.
3. Requiring that applicants requesting extension of construction permits show clear and definite evidence of forward movement towards operational status and by revoking the permits for channels demonstrating no activity. Such action would facilitate regional and local planning by eliminating the spectre of large but impotent reservations which hinder and frequently discourage potential development.

D. That the Commission undertake as soon as possible a thorough and honest review of education's present and potential needs for the 2500-2690 MHz band. This review should be the responsibility of educators rather than broadcasters, and should include considerations of programming and instructional significance in addition to technical considerations of spectrum utilization.

E. That the Commission examine other portions of the radio spectrum for the development both of instructional television and of those industrial and commercial operations which now occupy or covet the 2500 MHz band.

F. That, if the development of other portions of the radio spectrum is being hindered by the lack of available transmitting and/or receiving equipment within previously unused bands, the federal government subsidize the development of such hardware to encourage the systematic and coordinated development of all of the available spectrum by education and non-education agencies.

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APPENDIX

Appendix A

Original Frequency Assignments - Docket No. 14744

Adopted July 25, 1963

Group A		Group B		Group C	
Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz
A-1	2500-2506	B-1	2506-2512	C-1	2512-2518
A-2	2536-2542	B-2	2542-2548	C-2	2548-2554
A-3	2572-2578	B-3	2578-2584	C-3	2584-2590
A-4	2608-2614	B-4	2614-2620	C-4	2620-2626
A-5	2644-2650	B-5	2650-2656	C-5	2656-2662
A-6	2680-2686				

Group D		Group E		Group F	
Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz
D-1	2518-2524	E-1	2524-2530	F-1	2530-2536
D-2	2554-2560	E-2	2560-2566	F-2	2566-2572
D-3	2590-2596	E-3	2596-2602	F-3	2602-2608
D-4	2626-2632	E-4	2632-2638	F-4	2638-2644
D-5	2662-2668	E-5	2668-2674	F-5	2674-2680

Appendix B

Present Frequency Assignments - Docket No. 15181 - Adopted May 20, 1964

Group A		Group B		Group C		Group D	
Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz
A-1	2500-2506	B-1	2506-2512	C-1	2548-2554	D-1	2554-2560
A-2	2512-2518	B-2	2518-2524	C-2	2560-2566	D-2	2566-2572
A-3	2524-2530	B-3	2530-2536	C-3	2572-2578	D-3	2578-2584
A-4	2536-2542	B-4	2542-2548	C-4	2584-2590	D-4	2590-2596

Group E		Group F		Group G		Group H	
Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz	Channel No.	Band Limit MHz
E-1	2596-2602	F-1	2602-2608	G-1	2644-2650	H-1	2650-2656
E-2	2608-2614	F-2	2614-2620	G-2	2656-2662	H-2	2662-2668
E-3	2620-2626	F-3	2626-2632	G-3	2668-2674	H-3	2674-2680
E-4	2632-2638	F-4	2638-2644	G-4	2680-2686		

Appendix C

Frequency Assignments for Response Stations - Docket No. 18346

Adopted March 11, 1970

Group A		Group B		Group C		Group D	
Channel No.	Frequency MHz	Channel No.	Frequency MHz	Channel No.	Frequency MHz	Channel No.	Frequency MHz
A-1	2686.0625	B-1	2686.1875	C-1	2686.3125	D-1	2686.4375
A-2	2687.0625	B-2	2687-1875	C-2	2687.3125	D-2	2687.4375
A-3	2688.0625	B-3	2688.1875	C-3	2688.3125	D-3	2688.4375
A-4	2689.0625	B-4	2689.1875	C-4	2689.3125	D-4	2689.4375

Group E		Group F		Group G		Group H	
Channel No.	Frequency MHz	Channel No.	Frequency MHz	Channel No.	Frequency MHz	Channel No.	Frequency MHz
E-1	2686.5625	F-1	2686.6875	G-1	2686.8125	H-1	2686.9375
E-2	2687.5625	F-2	2687.6875	G-2	2687.8125	H-2	2687.9375
E-3	2688.5625	F-3	2688.6875	G-3	2688.8125	H-3	2688.9375
E-4	2689.5625	F-4	2689.6875	G-4	2689.8125	**	2689.9375

** Frequency 2689.9375 MHz is not paired with any ITFS channel and will be held in reserve to meet unforeseen contingencies.

Appendix D

Private Users Authorized in the 2500-2690 MHz Band, April 1970

Licensee	Service	Emission	Useage	Date Granted	No. of Station	Location
Commonwealth of Pennsylvania Turnpike Comm.	Highway Maintenance	3000F9	Voice channels, teletype, telephone circuits	1954	18	East to West in So. Pa.
Union Oil of California	Petroleum	3200F9 4000F9	Telemetering, voice, teletype dial telephone for company use	1955	12	Extends from Napa Co. to Kern Co.
City of Los Angeles	Local Gov't	4000F9	Voice and control circuits	1956	3	L.A and Seal Beach
Phillips. Petroleum Co.	Petroleum	3200F9	Voice communication	1958	3	Napa Co. Calif.
Mobil Company	Petroleum	3200F9	Multiplex transmission of voice, telemetering and control signals	1958	3	Los Angeles County
El Paso National Gas Company	Petroleum	4000F9	Voice, telemetry, station control	1963	10	San Juan & Rio Arriba Cos, N.M. & Coconino, Ariz.

Licensee	Service	Emission	Useage	Date Granted	No. of Station	Location
City & County of Denver, Colorado	Fire	2584-2570 (C-4) A5, F3	CCTV for civil disturbance prevention	1966	1	Denver
United Airlines	Aviation	6000A5	Flight operational information CCTV service to UAL air freight terminal	1967	4	Cleveland, Ohio, Portland, Ore. L.A., Calif. Philadelphia
State of Nebraska	Special Emergency	250F3 5750A5	Transmission of audio and video materials for flood, disaster, riot and related emergency information	1968	2	Lincoln, Nebraska
Textron, Inc.	Manufacturers	6000 A5/F3	Visual monitoring of main entrance or remote plants for security	1968	2	Lee Co., Iowa
Western Air Lines	Aviation	2650-2656 A5-F3 2662-2668	Operation of aircraft on airport video communic.	1969	1	San Francisco California

Appendix E

FCC Establishes Committee for Full Development of Instructional Television Fixed Service

Public Notice FCC-907, October 11, 1965

By the Commission: Commissioner Hyde absent.

On February 9, 1965, in Washington, D.C., the Commission held a meeting of experts from all areas of the country concerned with the Instructional Television Fixed Service....One of the recommendations of the meeting related to the establishment of a national committee to work for the development of the I.T.F.S. A number of educators at the meeting indicated a desire to serve on such a committee.

The growth of 2500 mc/s systems throughout the country, especially in urban areas, and the incipient shortage of channels in some areas because of uncoordinated planning suggest the need to establish national and regional groups of educators interested in the I.T.F.S. to achieve utilization of these channels, and to provide information both to the Commission and to education at large on the development of I.T.F.S.

Accordingly, the Commission is establishing a national Committee for Full Development of Instructional Television Fixed Service. Commissioner Robert E. Lee will serve as permanent chairman of the Committee. The Committee will be composed wholly of representatives of State and local agencies, and educational, charitable, religious, civic, social welfare and other similar nonprofit organizations. It may invite industry representatives to attend its meetings. Membership in the national Committee will be drawn from five divisions operating under the Committee: four regional divisions...and one division representing national organizations.

Appendix F

Present Members of Committee for Full Development of ITFS

EXECUTIVE BOARD

*Dr. George E. Bair (Southern)
Director of Television
University of North Carolina
Chapel Hill, North Carolina 27514

*Dr. Bernarr Cooper (Northeast)
Chief, Bureau of Mass Communication
State Education Department
Albany, New York 12224

Reverend Michael J. Dempsey
Assistant Superintendent of Schools
Diocesan School System
75 Green Avenue
Brooklyn, New York 11238

*Mr. Allan Fink (Western)
Coordinator of Learning Materials
Pasadena City Schools
351 South Hudson Avenue
Pasadena, California 91109

*Dr. Lawrence T. Frymire (Midwestern)
Department of Speech and Theatre
University of Illinois at Chicago Circle
Box 4348
Chicago, Illinois 60680

* Regional Chairmen

Mr. Robert Maull
Executive Director
Instructional and Professional Services
National Association of Educational Broadcasters
1346 Connecticut Avenue N.W.
Washington, D.C. 20036

Dr. Harold Wigren
ETV Consultant
National Education Association
1201 16th Street N.W.
Washington, D.C. 20036

NATIONAL COMMITTEE

Mr. Emell Beech
Assistant Director
Educational Services
Compton City Schools
604 S. Tamarind Street
Compton, California 90220

Dr. Clair W. Black
Vice President
Farleigh Dickinson University
Rutherford, New York

Dr. Frederick Breitenfeld, Jr.
Executive Director
Maryland Center for Public Broadcasting
Owings Mills, Maryland 21117

Mr. Ward B. Chamberlain, Jr.
Vice President
Corporation for Public Broadcasting
1345 Avenue of Americas
New York, New York 10019

Mr. Nile D. Coon
Director, Bureau of Instructional Services
State Department of Public Instruction
Box 911
Harrisburg, Pennsylvania 17126

Mr. Robert P. Danilowicz
General Manager, ETV Services
Rhode Island Department of Education
600 Mt. Pleasant Avenue
Providence, Rhode Island 02908

Dr. June Dilworth
KCTS-TV
University of Washington
Seattle, Washington, 98105

Mr. James Frehner
Director of Instructional Television
Mesquite Independent School District
405 East Davis Street
Mesquite, Texas 75149

Mr. Robert C. Glazier
General Manager, KETC
6996 Millbrook Road
St. Louis, Missouri 63130

Mr. Hugh Green
Director, State Telecommunications System
1100 West Michigan Street
Indianapolis, Indiana 46202

Very Reverend Monsignor John J. Healy
Coordinator for Instructional Television
New York Archdiocese
Communications Center
Seminary Avenue
Yonkers, New York 10704

Mr. Harold E. Hill
Radio-Television Department
University of Colorado
Boulder, Colorado 80302

Reverend Leonard Hurley
Director of Communications
St. Peter's Rectory
313 Second Street S.E.
Washington, D.C. 20003

Mr. Harry A. Johnson
Director of Educational Media
Virginia State College
Petersburg, Virginia

Mrs. Marion Lowry
Coordinator, Instructional Television Center
6000 S.W. Nova Drive
Fort Lauderdale, Florida 33314

Dr. Edward J. Meade, Jr.
Program Officer for Public Education
Ford Foundation
320 East 43rd Street
New York, New York

Mr. Frank Norwood
Executive Secretary
Joint Council on Educational Telecommunications
1126 16th Street N.W.
Washington, D.C. 20036

Mr. Charles Perry
President, Florida International University System
Tamiami Trail
Miami, Florida 33144

Dr. Joseph Pettit
Dean, School of Engineering
Stanford University
Palo Alto, California

Dr. Robert W. Pirsein
ITV Coordinator
New Trier Township
385 Winnetka Avenue
Winnetka, Illinois 60093

Brother John Samaha, S.M.
ITFS Coordinator
Educational Television Center
Archdiocese of San Francisco
1599 Hoover Avenue
Burlingame, California 94010

Mr. Donald D. Severaid
Director of Engineering
Iowa Educational Broadcasting Network
P.O. Box 1758
Des Moines, Iowa

Mr. Robert Lewis Shayon
Annenberg School of Communications
University of Pennsylvania
Philadelphia, Pennsylvania

Mr. William Smith
Director
Mississippi Authority for ETV
P.O. Drawer 2470
Jackson, Mississippi 39205

Mr. Robert R. Suchy
Director, Instructional Resources
Milwaukee Public Schools
5525 West Vliet Street
Milwaukee, Wisconsin 53208

Mr. Sidney Tickton
Vice President
Academy for Educational Development
1424 16th Street N.W.
Washington, D.C. 20036

Dr. James B. Tintera
Director
Center for Instructional Technology
Wayne State University
70 Palmer Street
Detroit, Michigan 48202

Mr. Richard C. Walker
Director, Television Services
Delaware State College
Dover, Delaware

Appendix G

FCC Application Procedure

FCC APPLICATION PROCEDURE

The licensing of stations is not difficult but does require care and accuracy in the preparation of the application forms. Qualified engineering and legal help is recommended. The applicant should first obtain copies of FCC Form 330-P, "Application for Authority To Construct or Make Changes in an Instructional Television Fixed Station."

This is a five-section application for a construction permit that must be formally approved by the FCC before a station can begin construction. The entire application is submitted in triplicate, with an extra copy of Sections I and V, which the FCC sends for comments and recommendations to the appropriate subcommittee (in the applicant's locality or geographical area) of the national Committee for the Full Development of the Instructional Television Fixed Service.

After the application is submitted to the Secretary of the Federal Communications Commission (Washington, D.C. 20554) and if it is complete and in conformity with the rules, it is formally accepted for filing and assigned a file number. An application is not acted upon until 30 days following acceptance. (During this time it is subject to objecting petitions.)

Processing of applications involves three major areas of examination and review: engineering, financial, and legal. The engineering examination verifies calculations to determine if the application conforms to the technical requirements of the Commission's rules and includes study of the geometric patterns of the proposed stations and other existing or potential ITFS systems, as well as operational fixed systems in other services which share this band. The choice of channels is also examined to ensure that it reflects the most efficient ITFS use.

An accountant checks the financial qualifications, including adequacy of resources and matters such as discrepancies between estimated and probable actual operating costs and total costs balanced against particular costs. The financial examination is particularly concerned with verification of the source of funds; that is, whether or not the applicant has the necessary funds to construct and operate the system or has been given the authority to use the money, bonds, securities, or other financing described in the application.

Attorneys determine whether the applicant is qualified under the Communications Act to become a licensee. They review technical and financial findings, check the corporate structure, and determine if there are any matters before the FCC that might affect the applicant.

When an application for a new station or for changes in an existing facility is approved, a Construction Permit (CP) is issued. The permittee has 60 days in which to begin construction and a period of six months thereafter for completion of the project. If the permittee finds that the station cannot be constructed in the specified time due to causes unforeseen at the time the application was filed, he may apply for an extension.

When construction of the facility is completed in accordance with the CP, the permittee may conduct equipment tests, following notification to the Commission. Application for the license may be submitted, accompanied by measurements of equipment performance. Following submission of a satisfactory license application, the permittee may begin program testing without further authority from the FCC, provided that the engineer in charge of the district in which the station is located and the FCC in Washington are notified (by telegram) at least two days before the beginning of such operations. In effect, this permits the CP holder to begin regular station operation and programing, although the license itself is not granted until the license application receives final approval. Do not confuse the application for the construction permit (the first step) with the application for the license (the final step), which permits the beginning of programing as outlined above.

Appendix H

FCC Form 330P (Revised)

CC Form 33'P
ec. 1966

Form Approved
Budget Bureau No. 52-R136.2

ction 1

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

:ATION FOR AUTHORITY TO CONSTRUCT OR MAKE CHANGES IN AN INSTRUCTIONAL TELEVISION FIXED STATION

INSTRUCTIONS

A. This form is to be used only in applying for authority to construct a new Instructional Television Fixed station or to make changes in an existing station. This form consists of this part, Section 1, and the following sections:

- Section II, Legal Qualifications of Applicant
- Section III, Financial Qualifications of Applicant
- Section IV, Statement of Program Service of Applicant
- Section V, Engineering Data

B. PREPARE THREE COPIES of this form and all exhibits, and ONE ADDITIONAL COPY OF SECTIONS I and V and related exhibits. Sign one copy of Section 1. File all of the above with the Federal Communications Commission, Washington, D.C. 20554. The extra copy of Sections I and V will be forwarded to the appropriate subcommittee of the Committee for the Full Development of the Instructional Television Fixed Service and their comments and recommendations solicited.

C. Number exhibits serially in the space provided in the body of the form and list each exhibit in the space provided on page 2 of this Section. Show date of preparation of each exhibit, antenna pattern, and map.

D. The name of the applicant stated herein shall be the exact corporate name, if a corporation; if an unincorporated association, the exact name of the association; if a governmental or public educational agency, the exact name of such agency. The applicant must notify the Commission of any change of address.

E. A single application should be used for more than one channel if the c ted transmitters are to be located at a common antenna site. T itters having different transmitting antenna locations must be filed on SEPARATE applications.

F. Information called for by this application which is already on file with the Commission need not be refiled in this application provided (1) the information is now on file in another application or FCC form filed by or on behalf of this applicant; (2) the information is identified fully by reference to the file number (if any), the FCC form number and the filing date of the application or other form containing the information and the page or paragraph referred to, and (3) after making the reference, the applicant states: "No change since date of filing." Any such reference will be considered to incorporate into this application the application or other form referred to in its entirety. Do not incorporate by reference any material which is not to be open to the public.

G. This application shall be personally signed by the applicant, if the applicant is an individual; by one of the partners, if the applicant is a partnership; by an officer, if the applicant is a corporation; by a member who is an officer, if the applicant is an unincorporated association; by such duly elected or appointed officials as may be competent to do so under the laws of the applicable jurisdiction, if the applicant is an eligible government entity; or by the applicant's attorney in case of the applicant's physical disability or of his absence from the United States. The attorney shall, in the event he signs for the applicant, separately set forth the reason why the application is not signed by the applicant. In addition, if any matter is stated on the basis of the attorney's belief only (rather than his knowledge), he shall separately set forth his reasons for believing that such statements are true.

H. Before filing out this application, the applicant should familiarize himself with the Communications Act of 1934, as amended, Parts 1, 2, 17 and 74 of the Commission's Rules and Regulations.

I. *BE SURE ALL NECESSARY INFORMATION IS FURNISHED AND ALL PARAGRAPHS ARE FULLY ANSWERED. IF ANY PORTIONS OF THE AP CATION ARE NOT APPLICABLE, SPECIFICALLY SO STATE. DE IVE OR INCOMPLETE APPLICATIONS MAY BE RETURNED WITHOUT CONSIDERATION.*

FOR COMMISSION USE ONLY

File No.

Name and address of applicant (See Instruction D)

Name

Address

City State Zip Code

Send notices and communications to the following-named person at the post office address indicated:

Name

Address

City State Zip Code

1. Requested facilities for Instructional Television Fixed Station (See Instruction E)

a. Channel No. (s):

b. Principal area to be served:
(School District or other descriptive location.)

c. If thi app cation is for fewer than four channels, will application later be m fo additional channels, and if so, when is it anticipated that such application will be filed?

2. If authority to make changes in an existing station or authorization is requested:

a. File no. and call of authorization:

b. Present facilities:
Channel No. (s)

c. Principal area served:

d. If this application is for changes in an existing authorization, complete Section 1 and any other sections necessary to show all substantial changes in information filed with the Commission in prior applications or reports. In the space below check Sections submitted herewith and as to Sections not submitted herewith refer to the prior application or report containing the requested information in accordance with Instruction F.

Section No.	Para. No.	Reference (file or Form No. and date)
☐ Section II		
☐ Section III		
☐ Section I V		
☐ Section V		

3. Have there been any substantial changes in the information incorporated in this application by reference in this paragr ph? Yes ☐ No ☐

If "Yes," submit as Exhibit No. full particulars.

Is this application filed for the purpose of impeding, obstructing or delaying determination on any other application with which it may be in conflict? Yes ☐ No ☐

If "Yes," detail full particulars:

THE APPLICANT hereby waives any claim to the use of any particular frequency or of the ether as against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise, and requests an authorization in accordance with this application. (See Section 304 of the Communications Act of 1934).

THE APPLICANT represents that this application is not filed for the purpose of impeding, obstructing, or delaying determination on any other application with which it may be in conflict.

THE APPLICANT acknowledges that all the statements made in this application and attached exhibits are considered material representations, and that all the exhibits are a material part hereof and are incorporated herein as if set out in full in the application.

CERTIFICATION

I certify that the statements in this application are true, complete, and correct to the best of my knowledge and belief, and are made in good faith.

Signed and dated this ________ day of ______________________________ , 19______.

____
(NAME OF APPLICANT)

By ____
(SIGNATURE)

Title ______________________________________

WILLFUL FALSE STATEMENTS MADE ON THIS FORM ARE PUNISHABLE BY FINE AND IMPRISONMENT. U.S. CODE, TITLE 18, SECTION 1001.

If applicant is represented by legal and/ or engineering counsel, state name(s) and post office address(es):

BITS furnished as required by this form:

Exhibit No.	Section and Para. No. of Form	Name of officer or employee (1) by whom or (2) under whose direction exhibit was prepared (show which)	Official title

C Form 330P FEDERAL COMMUNICATIONS COMMISSION Section II, Page 1

LEGAL QUALIFICATIONS OF APPLICANT	Name of Applicant	FOR COMMISSION USE ONLY File No.

INSTRUCTIONS

As used in this Section, the words "party to this application" mean: (1) in the case of a corporate applicant with outstanding stock, all officers, directors, stockholders of record, persons owning the beneficial interest in any stock, subscribers to any stock, and persons who voted any of the voting stock at the last stockholders meeting; (2) in the case of any other applicant which is not a governmental or public educational agency, all executive officers, members of the governing board; and owners or subscribers to any membership or ownership interest in the applicant; (3) in the case of an applicant which is a governmental or public educational agency, the members of the governing board and chief executive officers thereof.

1. Describe clearly and in detail the character and legal nature of the applicant (a corporation, unincorporated legal entity, or public body; a public or private educational institution; a State, county, city or other political subdivision, a board of education, school board or district, board of regents or trustees, or other department or unit of a state or one of its political subdivisions; a nonprofit corporation or unincorporated association formed for the purpose of operating a noncommercial educational broadcasting station) including the State, District, Territory or Possession under the laws of which the applicant is organized.

2. a. State whether applicant is a nonprofit educational institution. Yes ☐ No ☐

b. If the applicant is a nonprofit educational organization, describe in Exhibit No. how the proposed station will be used for the advancement of an educational program. This does not apply if applicant is applying for change in facilities.

3. Submit as Exhibit No. three copies, one of which must be properly certified to

(a) If applicant is a corporation, the articles of incorporation (or charter) and the by-laws (with amendments to both, if any), certified by the Secretary of State or other appropriate official.

(b) If applicant is an unincorporated association, or other legal entity, the articles of association or other legal instrument under which applicant is organized showing the purposes thereof, and the by-laws, if any (with amendments to both, if any).

(c) If applicant is a public educational institution, the laws (and amendments thereof) under which it was created with an appropriate citation as to the source thereof.

(d) If the applicant is a political subdivision, or a board, department or unit thereof, the laws (and amendments thereof) under which said subdivision, board, department or unit was created with an appropriate citation as to the source thereof.

4. Indicate specifically by reference to page and paragraph of the articles of incorporation or of association, or of the political subdivision, the charter powers relied upon by the applicant to show that it is legally empowered to construct and operate the proposed station.

5. Are all parties to this application citizens of the United States? Yes ☐ No ☐

If "No," state the name and citizenship of each party who is not a citizen of the United States.

6. Is United States citizenship of any party to this application claimed by reason of naturalization? Yes ☐ No ☐

If "Yes," state the name of such party, the date and place of issuance of final certificate of naturalization, certificate number, and name and location of the court authorizing issuance of same.

7. Is United States citizenship of any party to this application claimed by reason of naturalization of a parent? Yes ☐ No ☐

If "Yes," state the name of such party, the name of the parent to whom the final certificate was issued, the age of the party to this application at the time the certificate was issued, and any additional facts relied on to establish citizenship.

8. a. Is applicant or any party to this application a representative of an alien or of a foreign government? Yes ☐ No ☐

b. If applicant is a corporation, is more than 20 percent of the capital stock owned of record or may it be voted by aliens or their representatives, or by a foreign government or a representative thereof, or by any corporation organized under the laws of a foreign country? Yes ☐ No ☐

c. If applicant is a corporation and is controlled by another corporation or corporations, is more than 25 percent of the capital stock of such controlling corporation or corporations owned of record or may it be voted by aliens, their representatives, or by any corporation organized under the laws of a foreign country? Yes ☐ No ☐

d. If the answer to any of the foregoing parts of this paragraph is "Yes," submit as Exhibit No. a full disclosure concerning the persons and matters involved.

[illegible] Has the applicant or any party to this application been fully adjudged guilty by a Federal court of unlawfully monopolizing or attempting unlawfully to monopolize radio communications, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive traffic arrangements, or by any other means, or to have been using unfair methods of competition? (See Section 313 of the Communications Act of 1934, as amended) Yes ☐ No ☐

b. If "Yes," submit as Exhibit No. a full disclosure concerning the persons and matters involved, identifying the court and the proceedings (by dates and file numbers) stating the facts upon which the proceeding was based or the nature of the offense committed, and the disposition of the matter.

. Is applicant directly or indirectly controlled by another legal entity? Yes ☐ No ☐

If "Yes", state below the name of such other legal entity, and state how such control, if any, exists and the extent thereof.

1. Give the following information as to applicant's officers, members of governing board, and holders of 1% or more ownership interest (if any).

Name and Residence	Office Held	Citizenship	Principal Profession or Occupation	By whom appointed or elected

2. Instructional Television Fixed station applicants which are nonprofit organizations rather than governmental bodies or educational institutions submit as Exhibit No. evidence that officers, directors, and members of the governing board are broadly representative of the educational, cultural, and civic groups in the community. This does not apply if applicant is applying for change in facilities.

. The Commission is seeking in this paragraph information as to contracts and arrangements now in existence, as well as any arrangements or negotiations, written or oral, which relate to the present or future ownership, control or operation of the station; the questions must be answered in the light of this instruction.

pplicant's control over the station is to be by reason of: (Indicate by check mark)

☐ Ownership ☐ Lease ☐ Other Authority

b. Name and address of the owner of the station (if other than the applicant)

c. Will the applicant have and maintain absolute control of the station, its equipment, and operation, including complete supervision of the programs to be broadcast?

Yes ☐ No ☐

If "No," explain.

d. Are there any documents, instruments, contracts or understandings relating to ownership, use or control of the station or facilities, or any right or interest therein?

Yes ☐ No ☐

If "Yes," attach as Exhibit No. three copies of all such documents, instruments or contracts and state the substance of oral contracts or understandings.

14. a. If the execution of this application was duly authorized by a governing body, give date and place of the meeting of said governing body.

b. Submit as Exhibit No. three copies, one of which must be certified, of the resolution showing: (i) a quorum of members having authority to act was present, (ii) the resolution was voted favorably by the members required, (iii) the officer executing the application was authorized to do so.

15. Does applicant or any party to this application have now, or has applicant or any such party had, any interest in, or connection with, the following:

a. Any standard, FM, or television broadcast station? Yes ☐ No ☐

b. Any application pending before the Commission? Yes ☐ No ☐

Any broadcast station the license or C.P. of which has been revoked? Yes ☐ No ☐

If the answer to any of the foregoing parts of this paragraph is "Yes," show particulars in the table below:

(1) Name of party having such interest	(2) Nature of interest or connection (giving dates)	(3) Name of other applicant or call letters of station	(4) FCC File Number

330P	FEDERAL COMMUNICATIONS COMMISSION	Section III, Page 1
FINANCIAL QUALIFICATIONS OF APPLICANT	Name of Applicant	FOR COMMISSION USE ONLY File No.

INSTRUCTIONS

the questions that follow, the Commission is seeking information as to contracts and arrangements now in existence, as well as any arrangements negotiations, written or oral, which relate to the present or future financing of the station; the questions must be answered in the light of this struction.

Give estimated costs for installation of facilities and equipment for which application is made. The costs shown for the following must be the sts in place and ready for service, including the amounts for labor, supervision, materials, supplies, and freight. To the extent that all or part the items below are covered by a contract or contracts containing a single quotation, the details of such contract or contracts shall be stated in u of the estimates called for below; but, in any event, the cost figures must represent costs in place and ready for service.

Transmitter(s) proper including tubes llation costs r $ vision $ ials & plies $ ht $	Transmitting Antenna system(s), including tower, coupling equipment, transmission line $ Installation costs Labor $ Supervision $ Materials & supplies $ Freight $	Receiving and distribution system(s) $ Installation costs Labor $ Supervision $ Materials & supplies $ Freight $

Studio technical equipment, microphones, transcription equipment, cameras, etc. llation costs r $ vision $ ials & plies $ ht $	Acquiring land $	Acquiring, Constructing or Modifying buildings $	Other items (state nature) $

l Cost $

Estimated cost of operation for first year $

State the basis of the estimates in (1a.) above.

The proposed construction is to be financed and paid for in the following manner (including specified statements as to the approximate amount to be met d paid for from each source). The financial plan should provide for any additional construction costs should the actual cost exceed the original timated cost.

Existing capital	New capital $	Loans from banks or others $	State, County, Municipal appropriations $

Donations	Credit, deferred payments, etc.	Other sources (specify)

1d. Provide full information as to the sources of funds for the first year's operation of the proposed station, including the following:

Source	On hand	Anticipated	Total
(1) State, County, Municipal appropriations			
(2) Schools, colleges, or universities			
(3) Foundations (specify)			
(4) Civic Groups			
(5) Individual donations			
(6) Project Income (production services and contracts, tuition, study guides, non-broadcast activities, etc.)			
(7) Other (specify)			
TOTAL			

2. With respect to the funds referred to in Question 1(c) and 1(d) above, furnish information showing the availability of such funds, including:

for governmentally appropriated funds, the date, amount, appropriating body, and object of the appropriation, with any restrictions thereon;

b. for other than governmentally appropriated funds or Federal grants, submit as Exhibit No. a detailed balance sheet of applicant, showing financial position as at the close of a month within 90 days of the date of application. If the status and composition of any assets and liabilities on the balance sheet are not clearly defined by their respective titles, attach as Exhibit No. schedules which give a complete analysis of such items;

c. for all applicants, attach as Exhibit No. a copy of the applicant's current annual budget, insofar as it relates to existing broadcasting operation(s).

3. Furnish the following information with respect to the non-governmental applicant only. If the answer is "None" to any or all items, specifically so state:

a. Amount of funds on deposit in bank or other depository

b. Name and address of the bank in which deposited

c. Name and address of the party in whose name the money is deposited

d. Conditions of deposit (in trust, savings, subject to check, on time deposit, who may draw on account and for what purpose, or other condition)

e. Whether the funds were deposited for the specific purpose of constructing and operating the station

rm 330P	FEDERAL COMMUNICATIONS COMMISSION	Section IV, Page 1
STATEMENT OF PROGRAM SERVICE OF APPLICANT	Name of applicant	FOR COMMISSION USE ONLY File No.

ch as Exhibit No.   the applicant's purpose and objective in establishing the proposed station and a statement of proposed program policies. If plicant already has such information on file, indicate file number and detail changes, if any.

ch as Exhibit No.   a proposed weekly schedule of program together with a brief description of programs not recognizable by their titles. (It is expected that the licensee will or can adhere inflexibly in day-to-day operation to the representation made here. However, since such representation l constitute, in part, the basis upon which the Commission acts on the application, time and care should be devoted to the preparation of the reply so t it will reflect accurately the applicant's responsibile judgment of his proposed programming policy.) If applicant already has such information on file, licate file number and detail changes, if any.

TE: The following are examples of Program data:

Sources of programs are defined as follows:

A local program (L) is any program originated or produced by the station, employing live talent more than 50% of the time, and using the studios or er facilities of the station. A local program recorded or filmed by the station for later transmission shall be classified as local. A program produced by a tion and fed to a network shall be classified by the originating station as local. Programs primarily featuring phonograph records, syndicated or feature s or taped or transcribed programs, shall not be classified as local even though a station personality appears incidentally to introduce such material.

A record program (REC) (Radio only) is any program, not falling within the definition of "local" above, which utilizes phonograph records, elec- cal transcriptions or taped music, with or without commentary by a local announcer, or other station personnel.

A network program (N) is any program furnished to the station by a network (national, regional or special) such as NET, NAEB Radio Tape Network, stern Educational Network, Educational Radio Network, etc.

Other Programs (OTHER) are any programs not defined above, including, without limitation, syndicated film, taped or transcribed programs, and ture films.

Types of educational programs are defined as follows:

Instructional (I) includes all programs designed to be utilized by any level of educational institution in the regular instructional program of the stitution. In-school, in-service for teachers, and college credit courses are examples of instructional programs.

eneral Educational (GEN) is an educational program for which no formal credit is given.

Performing Arts (A) is a program, live or recorded, in which the performing aspect predominates such as drama or concert, opera or dance.

Public Affairs (PA) includes talks, discussions, speeches, documentaries, editorials, forums, panels, round tables, and similar programs pririly concerning local, national, and international affairs or problems.

Light Entertainment (LE) includes programs consisting of popular music or other light entertainment.

Other (O) includes all programs not falling within the definitions of Instructional, General Education, Performing Arts, Public Affairs or Light tertainment. Such programs as news or sports should be reported as "other."

Will the applicant transmit any program which will promote any activity other than education in which the applicant or any party to the application is engaged or financially interested, whether directly or indirectly?

☐ Yes ☐ No

If "Yes," submit as Exhibit No.   a list of such programs together with comments showing the relationship of the programs to the applicant's other interests.

Attach as Exhibit No.   a description of facilities, staff, and equipment available to the applicant for his development and production of program material. Include here such items as, for example, studio facilities; services subscribed to and libraries of program material maintained; cameras, tape recorders, remote equipment, etc.; staff personnel used in program production. If applicant already has such information on file, indicate file number and detail changes, if any.

Will the proposed station be affiliated with any network(s)?

☐ Yes ☐ No

If "Yes," give the name of the network(s).

TE: The NET, NAEB Radio Tape Network, Educational Radio Network, and the Eastern Educational Network are examples of educational networks.

Form 330P

FEDERAL COMMUNICATIONS COMMISSION

Section V - Page 1

RING DATA	NAME OF APPLICANT	FOR COMMISSION USE ONLY File No.

1. Purpose of authorization applied for: (Indicate by check mark.)

☐ (a) Construct a new station

☐ (b) Modify an existing authorization to change:

☐ 1. Transmitter type or modification
☐ 2. Transmitting Antenna type, gain or directivity
☐ 3. Transmitting Antenna height or location
☐ 4. Transmitter control method
☐ 5. Transmitter location
☐ 6. Frequency assignment
☐ 7. Operating power
☐ 8. Other (describe below)

File number and call of authorization to be modified:

Note: In applications for changes in existing authorizations, only the following items pertinent to the proposed changes need to be completed.

2. Facilities requested:

Note: Use a separate column for each transmitter located at the site specified in Item 3 below. Include only transmitters having a common antenna site in this application. A separate application is required for each different transmitter location.

Transmitter Identification No.	T1	T2	T3	T4	T5 (for modification of existing facilities only)
Channel No. 1/					
Station Purpose 2/					
Signal Source (For relay station only) 3/					
Transmitter Make and Model No. 4/					
Transmitter Rated Output Power 5/					
Proposed Transmitter Operating Output Power 6/					
Transmitting Antenna Make and Model No. 7/					
Transmitting Antenna Type 8/					
Transmitting Antenna Maximum Lobe Gain (DB) 9/					
Transmitting Antenna Overall height above ground (FT) 10/					
Polarization of Radiated Signal 11/					

1/ Use channel designators shown in Rules for particular frequency band limit proposed, such as A-1, A-2, A-3, etc. (See Rule 74.902)
2/ Specify either "Originating" or "Relay."
3/ When station is to be used as a "Relay" station, indicate source of signal, i.e., other instructional TV fixed station, educational or commercial TV station, or other class of station, by entering call or file number and location of station to be relayed.
4/ Use abbreviation of manufacturer's name with model designation.
5/ Specify output power (peak visual) in watts as rated by manufacturer.
6/ Specify proposed operating output power (peak visual). Application proposing operating output power greater than 10 watts (peak visual) must be accompanied by special showing required by Section 74.935(b) of the Rules.
7/ Use abbreviation of manufacturer's name with model designation.
8/ State basic type using general descriptive terms, such as 6-ft. parabola, corner reflector, helix, etc.
9/ State maximum power gain (DB) in horizontal plane with respect to isotropic radiator.
10/ Specify proposed overall height of antenna above ground level in feet.
11/ Specify polarization of radiated signal, such as horizontal, vertical, left or right-hand circular, etc.

Has each one of the above-listed transmitters been type accepted by the FCC for this service? ☐ Yes ☐ No

If answer is "No," attach, as Exhibit No.__________, a complete showing of transmitter details, including technical specifications and schematic diagram. If this information is presently on file with the FCC by the manufacturer, omit such information from application and check here ☐.

Form 330P

Section V - Page 2

Proposed transmitter location:

) State	County	City

Address or other description of location

Geographical coordinates of transmitting antenna(s) to the nearest second:

North Latitude	West Longitude
° ' "	° ' "

b) Will the proposed transmitting antenna supporting structure be shared with another instructional television fixed station or station of any other classification? ☐ Yes ☐ No

If answer is "Yes," list the call sign and classification of each such station.

c) Attach, as Exhibit No._________, a map or maps of appropriate scale and detail (preferably U.S. Geological Survey Topographic Quadrangles) for the proposed area to be served by the transmitter(s) and show drawn thereon the following:

(1) Scale of miles.
(2) Direction of true north.
(3) Outline of principal school district or other area intended to be served by proposed system.
(4) Location of proposed transmitting site, accurately plotted.
(5) Location of all known radio stations (except amateur), such as AM, FM, TV, instructional TV fixed, operational fixed, police, fire, aeronautical, etc., and known commercial or government receiving sites, located within 1000 feet of the proposed site.
(6) Location of each receiving location intended to be served by each transmitter listed in Item 2 above. Each receiving location intended to be served should be identified by an individual symbol, such as R1, R2, etc. By means of a separate sheet, further identify the designated receiving sites by name of school or building, address, and azimuth and air line distance from the transmitter location.

Note: Where the receiving sites for the proposed system are so widely separated geographically that to show them on the same or several maps would result in an unwieldly and voluminous exhibit, it will be acceptable in lieu thereof to furnish a reduced composite exhibit consisting of a sketch drawn approximately to scale showing the azimuthal and distance relationships between the transmitting and receiving sites. In any event, the transmitter site shall be shown plotted on a map as described in Item 3(c) above.

(d) Attach, as Exhibit No.________ to __________, a map or sketch, drawn to scale, showing the boundaries of all local and county public and private school districts in and adjoining the area to be served, and the location or locations of the proposed transmitters. Since it is the purpose of the required maps or sketches only to show the geometric configuration of the proposed ITFS system and the pattern of school districts in which separate ITFS systems may be needed, they should not be cluttered with unnecessary details. Main roads may be shown for the purpose of relating the simple map or sketch with maps showing more detail. Major topographic features which affect the choice of transmitting sites, or would serve to contain potential interference, should be indicated.

(e) (1) Attach, as Exhibits No.___________ to ___________, separate vertical plan views of the antenna installation of the transmitting and each receiving location proposed, showing the ground elevation of the site above mean sea level, the height above ground of any building or other man-made structure on which the antenna(s) will be mounted, giving separate vertical dimensions for the building or other existing structure which may be used, and the entire height above ground of the tower or mast proposed to be erected to support the antenna(s). Indicate thereon the overall height above ground for each antenna. Each sketch shall be prepared on an 8 x 10½ inch sheet. The reference numbers used above, such as T1, T2, R1, R2, etc., should be used to identify the various transmitting and receiving locations.

(2) With each vertical plan view for the transmitting antenna(s), associate a separate 8 x 10½ inch sheet containing a polar diagram of the horizontal relative FIELD pattern and indicate thereon the direction of true north with respect to the proposed antenna orientation. Also label the polar diagram at the appropriate point with the maximum horizontal radiation lobe power gain expressed in db with respect to an isotropic radiator.

NOTE: In the event it is proposed to intentionally radiate power in directions other than toward the above-described receiving locations, a complete statement shall be furnished as to the purpose of such additional radiation.

4. Remote Control operation:

Will any transmitter listed above be operated by remote control? ☐ Yes ☐ No

If the answer is "Yes," and this application is for authority to construct a new station, or to employ remote control for the first time for an authorized station, attach an Exhibit, No.__________identifying applicable transmitters and furnish a full description as to the manner of compliance with Section 74.933 of the Rules.

5. Unattended operation:

Will any transmitter listed above be operated as an unattended automatic relay? ☐ Yes ☐ No.

If the answer is "Yes," and this application is for authority to construct a new automatic relay station, or to make changes in an authorized automatic relay station which will for the first time be operated unattended, attach an Exhibit, No.________, identifying applicable transmitters and furnish a full description as to the manner of compliance with Section 74.934 of the Rules.

6. The Federal Aviation Agency (FAA), pursuant to Part 77 of the Federal Aviation Regulations, requires notification of certain construction or alternation of antenna structures. Antenna structures which do not exceed an overall height of 20 feet above ground, and antenna structures increasing by 20 feet or less the height of existing man-made structures, other than existing antenna structures, do not require notification. Accordingly, applicant's determination as to whether filing of Form FAA-117 with the FAA is necessary for the proposed construction of either transmitting or receiving antenna structures shall be noted by checking the appropriate statement below:

☐ Notification to the FAA is not required for the construction proposed herein.

☐ Notification to the FAA for the construction proposed herein was filed on Form FAA-117 on____________________.

I certify that I represent the applicant in the capacity indicated below and that I have examined the foregoing statement of technical information and that it is true to the best of my knowledge and belief.

Date____________________

Signature______________________________

(check appropriate box below)

☐ Technical Director
☐ Registered Professional Engineer
☐ Consulting Engineer
☐ Chief Operator

☆ U. S. GOVERNMENT PRINTING OFFICE : 1967 O - 245-681

Appendix I

Survey: Questionnaire and Cover Letter

February 15, 1970

FRANCIS R. BIRMINGHAM, JR.
7603 RIVERDALE ROAD
NEW CARROLLTON, MARYLAND 20784

February 15, 1970

MEMORANDUM

TO: Administrator, Instructional Television Fixed Service
FROM: Francis R. Birmingham, Jr., Principal Investigator
RE: National survey of ITFS systems

When, in 1963, the Federal Communications Commission reserved the 2500 MHz band for Instructional Television Fixed Service, it was agreed that, before the reservation was "regularized," a survey would be taken to determine the utilization by education of the new system. Such a survey has never been instigated.

In 1970 we face a critical conflict. Education, on the one hand, desperately needs the economy, flexibility and instructional potential of ITFS; since 1963 creative educators have developed innovative and viable applications of this powerful instructional tool. Industry, on the other hand, is demanding access to the 2500 MHz band. Within the past month the FCC has approved the licensing as an industrial user of the St. Louis Police Department. Applications are pending from other industrial users, including the mighty Dow Chemical Company.

In light of this conflict the present survey, in which your cooperation is needed, attempts to document and evaluate the uses to which ITFS is being put. This national survey, of which I am principal investigator, is being conducted under the auspices of the Center for Educational Technology, Catholic University of America (Dr. Gabriel Ofiesh, Director) and the Maryland Center for Public Broadcasting (Dr. Frederick J. Breitenfeld, Executive Director). It is my conviction that both the quantity and the quality of currently operating facilities, as well as the futuristic plans of present and potential users, justify the continued reservation of these channels. I may be wrong. But the documentation is not available.

I am sending the enclosed questionnaire to you to obtain vital factual information. While I hesitate to impose on you in this way, there is no other source of information. On the enclosed form I have filled in the limited information I was able to obtain from FCC files; I am asking that you take five minutes to check the accuracy of the information I have provided and to fill in the remainder of the questionnaire.

As you can well imagine, I must have 100% return on the questionnaire in order to portray adequately and accurately the start of the art. Since the information obtained from the survey will, I hope, affect the decisions of the FCC on currently pending applications, I am eager to tabulate the results immediately.

Please take time today or tomorrow to answer these questions regarding your own 2500 MHz operation. I am enclosing a self-addressed stamped envelope for your return. If you have any additional comments or relevant information, I would be most grateful if you would send it along to me. I hope to receive your response by FEBRUARY 28, 1970.

Thank you very much for your cooperation.

Counted as 4 p

SURVEY ON THE UTILIZATION OF INSTRUCTIONAL TELEVISION FIXED SERVICE

1. Name of school system or institution ____________________

[illegible] Name of person responsible for ITFS ____________________

3. Title of person responsible for ITFS ____________________

4. **Staff**. Please indicate the number of full or part-time staff members in each of the following position categories. If there is no one in a position, please indicate by placing a "0" in the blank.

Full-time	Part-time	Position
________	________	Curriculum specialist. (If you do not have a staff person please indicate in the space below the sources of your curriculum inputs.)
________	________	Television teachers
________	________	Producer-director
________	________	Engineer
________	________	Television technicians
________	________	Graphics specialists
________	________	Clerical
________	________	Student assistants

Total full-time staff ____________________

Total part-time staff ____________________

5. **Equipment**. Please indicate the quantity of each type of equipment.

___ Transmitters. Manufacturer: ____________________
___ Down converters. Manufacturer: ____________________
___ Antenna. Manufacturer: ____________________
___ Image orthicon cameras. Color? ___
___ Vidicon cameras. Color? ___
___ Plumicon cameras. Color? ___
___ Videotape recorders
___ Kinescope recorders
___ Film or slide chain
___ 16mm projector
___ Opaque projector
___ Slide projector
___ Talk-back system
___ Mobile studio. Describe:
___ Other. Specify:

[illegible]. Number of studios: ___
Locations:

tion, please indicate by placing a "0" in the blank.

Full-time	Part-time	Position
________	________	Curriculum specialist. (If you do not have a staff person please indicate in the space below the sources of your curriculum inputs.)
________	________	Television teachers
________	________	Producer-director
________	________	Engineer
________	________	Television technicians
________	________	Graphics specialists
________	________	Clerical
________	________	Student assistants

Total full-time staff ________________

Total part-time staff ________________

5. Equipment. Please indicate the quantity of each type of equipment.

___ Transmitters. Manufacturer: ________________________________
___ Down converters. Manufacturer: ______________________________
___ Antenna. Manufacturer: ______________________________________
___ Image orthicon cameras. Color? ___
___ Vidicon cameras. Color? ___
___ Plumicon cameras. Color? ___
___ Videotape recorders
___ Kinescope recorders
___ Film or slide chain
___ 16mm projector
___ Opaque projector
___ Slide projector
___ Talk-back system
___ Mobile studio. Describe:
___ Other. Specify:

6. Number of studios: ____
Locations:

7. Percentage of local programming:

_____ Under 10% _____ 10%-25% _____ 25%-50% _____ 50%-75% _____ 75% +

8. Number of buildings receiving 2500 MHz signal: ________________

9. Approximate number of classrooms equipped with TV receivers: ________

10. Approximate number of students using ITFS facility: ____________

11. Approximate hours of scheduled programming per week: ____________

12. Approximate radius of area covered by ITFS system: ______________

13. Total number of instruction buildings receiving your signal: __________

14. Do institutions outside your own system receive your signal? If so, what arrangements have they made with you? __________

15. Programming. Which of the following types of programming do you provide via 2500 MHz television? Check all which apply.

___ Supplementary -- lessons presented once or twice.

___ Direct teaching by TV -- major part of a course presented by the TV teacher with some supplementary classroom work.

___ Enrichment -- programs designed to capture outstanding local resources which are not available to the classroom.

___ Total teaching -- entire course taught over TV with no assistance from the classroom teacher

___ In-service teacher education

___ Monitoring (e.g. study halls)

___ Testing

___ Film distribution

___ Orientation

___ Administrative announcements

___ Off campus college courses for which students receive college credit, pay tuition to the institution

___ Industrial location courses for which students receive credit, employer pays tuition

___ Religions training -- outside regular classes (e.g. CCD)

___ Panels, interviews, etc. in which students participate

16. Budget. Please answer both columns:

Capital investment (estimated amount)	Source	Operating expenses (estimated amount)
	Federal government	
	State government	
	Local government	
	Community (non-government)	
	Diocese or parishes	
	College or university	
	Other. Specify:	

17. Do any of your buildings videotape programs for rebroadcast over CCTV or other distribution system?

18. Have you worked with programmed instruction and ITFS? Specify:

19. Are you using or do you plan to use EVR or Selectavision?

20. Are you experimenting with any educational or technological innovations with your ITFS system? Explain briefly

teacher with some supplementary classroom work.

___ Enrichment -- programs designed to capture outstanding local resources which are not available to the classroom.

___ Total teaching -- entire course taught over TV with no assistance from the classroom teacher

___ In-service teacher education

___ Monitoring (e.g. study halls)

___ Testing

___ Film distribution

___ Orientation

___ Administrative announcements

___ Off campus college courses for which students receive college credit, pay tuition to the institution

___ Industrial location courses for which students receive credit, employer pays tuition

___ Religions training -- outside regular classes (e.g. CCD)

___ Panels, interviews, etc. in which students participate

16. Budget. Please answer both columns:

Capital investment (estimated amount)	Source	Operating expenses (estimated amount)
________	Federal government	________
________	State government	________
________	Local government	________
________	Community (non-government)	________
________	Diocese or parishes	________
________	College or university	________
________	Other. Specify:	________

17. Do any of your buildings videotape programs for rebroadcast over CCTV or other distribution system?

18. Have you worked with programmed instruction and ITFS? Specify:

19. Are you using or do you plan to use EVR or Selectavision?

20. Are you experimenting with any educational or technological innovations with your ITFS system? Explain briefly.

21. What firm conducted your original engineering study?

________ Date

________ Name of person answering form

________ Title

________ Signature